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CRITICISM OF SOME CASES OF APPARENT TRANSMISSION OF MUTILATIONS.[1]

TRANSLATED FROM THE GERMAN OF DR. O. VOM RATH.

Whenever a discussion arises as to whether characters acquired in the life of the individual are transmitted, first of all is ordinarily put the special question[2] whether the transmission of mutilations may be admitted. In various papers Weismann (32) has shown that the previously known cases of alleged transmission of mutilations do not hold their ground before careful criticism, and are far from serving as indisputable proof. In the judgment of such cases so much greater care is necessary, since it is often very difficult to decide

[1] TRANSLATOR'S NOTE.—This article appeared originally in the Berichte der Naturforschenden Gesellschaft zu Freiburg, i. Bn., Bd. VI, Heft 3, and was reprinted in the Biologisches Centralblatt, Bd. XIII, No. 3, p. 65–76, from which it was translated. Especially in its striking proof of the necessity of extreme care in sifting and testing evidence, it forms a most valuable contribution to the literature of a subject which, perhaps, more than most others, has been marked by failure to apply sharply the scientific method.—*Henry B. Ward, University of Nebraska, Lincoln.*

[2] The special question of the transmission of mutilations is of the greatest importance, since a single case of such transmission, if entirely beyond question, would be sufficient to decide finally *the entire matter of the inheritance of acquired characters,* since, in that case, the possibility of the transmission of all characters acquired in the lifetime of the individual, in physical as well as intellectual relations, would also have to be granted. By the by, I should like to mention just here, that at present some authors, and with them a part of the educated laity, are inclined to deny the transmission of single injuries or mutilations, but, on the other hand, to look upon the transmission of acquired characters upon the whole as possible.

whether the abnormality present in the paternal or maternal individual was actually caused by some external interference, or arose as an inborn (blastogenic) variation of the germ. Of those authors who deny the transmission of acquired characters, the pathologist, E. Ziegler (35), approaches most closely to the Weismannian point of view, and his valuable papers in which he discusses the most recent articles on inheritance and the doctrine of descent and their importance for pathology, form important supplements to the writings of Weismann. Among other things, E. Ziegler emphasizes the fact "that pathological characters acquired in the life of the individual are not transmitted, and that the first origin of transmissable diseases and mutilations is not to be sought in the acquirement of corresponding changes during the life of one of the parents, but in variations of the germ."

It is by no means my intention to go into the extensive literature on this point.[3] The purpose of my article is rather to communicate some interesting cases of apparent transmission of mutilations, which I learned of by personal experience, and was able to test carefully. If even now some of these cases do not permit a definite decision, still it may not be useless to recount them here, since, by just such examples which, at first glance, let no doubt of the fact of such transmission appear, it can best be shown with what extreme care an unpartisan observer must prove the true character of the case, and pass judgment upon it.

Before beginning my description, let me call attention to the fact that the expression "acquired character" has been used by different authors often in a very different sense. Weismann has expressed himself on this point as follows: "Since the term *acquired character* is not taken by all the in sharply circumscribed sense in which it is used by zoologists and botanists, I propose, in cases where a misunderstanding is possible, to use,

[3] I refer especially to the important papers in the appended list, those of Weismann (32), Ziegler (35), Eimer (9), Kölliker (16), Virchow (28), Claus (5) and others. In passing, I should like to call to mind the fact that two years ago the question of the inheritance of acquired characters was discussed clearly and pregnantly by van Bemmelen (1), in a historical critical investigation, with reference to the standpoint taken by Weismann, and with a review of the most important literature.

instead of *acquired*, the word *somatogenic*, i. e., proceeding from the body—*soma*—in contrast to the germ substance, and to designate such characters as proceed from the composition of the germ as blastogenic. If a man's finger is cut off, his tetradactyl condition is a somatogenic or acquired character; if, on the other hand, a child is born with six fingers, this condition must have proceeded from the peculiar constitution of the germ substance.[4] It is therefore a blastogenic character." In this description I shall adhere to Weismann's form of expression.

The facts of the first case are as follows: In a family closely related to myself was kept a pair of dogs (terriers), faultless in every particular; both dog and slut were known to have had fully normal parents, and on their part to have produced, in several litters, normal young. By an unfortunate fall, the dog suffered a break in the upper part of the right humerus, as a result of which, even to-day, there remains a peculiar posture of the damaged extremity, connected with continued limping. In the next litter, which followed some time after the complete recovery of the father, were three young, two dogs and a slut. The fully normal young slut died soon after birth. Shortly thereafter, the mother came to her end also. Of the two young

[4] The question whether such a sharp fundamental difference as Weismann emphasizes can be made between germ and body cells, so that every trace of germ plasm is wanting in the somatic cells, has been answered in varying manner by different authors, and, for example, is distinctly denied by Kölliker (16). That moreover, among the lower plants the difference between somatic and propagating cells may be very small, has been pointed out by Weismann himself (Biol. Centr. X, No. 1–2). "DeVries (29), the noted botanist, has pointed out that certain constituents of the cell-body, e. g., the chromatophores of the algæ are transmitted directly from the egg-cell of the mother to the daughter organism, while the male germ-cells ordinarily contain no chromatophores. Here then, the inheritance of somatogenic variations would be, it seems, possible. Yet, just in the lower plants, the difference between somatic and propogating cells is still slight, and the body of the egg-cell does not need to undergo a complete transformation in chemical and structural respects when it develops into the body of the somatic cells of the daughter individual. But what has that to do with the problem whether, for instance, the pianist can transmit to his descendants the strength of digital muscles acquired by practice. How does this result of his practice reach the germ-cells? Therein lies the riddle which they have to solve who maintain the transmission of somatogenic characters." For our purpose, however, this special question comes less into consideration since one may regard the question of the transmission of acquired characters for the present, as a purely empirical one.

dogs, the one was in every respect normally formed, and in color and form the true likeness of the mother, whereas the other dog not only resembled exactly the father, but also like him possessed an abnormally placed right fore leg, and continually limped with this leg from birth up to to-day, when the animal has long since reached full growth. At the sight of the dog, all eye-witnesses were completely convinced of the fact of the transmission of a former injury.

As will be easily understood, my attention was at once directed to establishing whether the peculiarities in question really corresponded exactly in father and son. To begin with, I found that after the fall, the right fore-leg of the father was essentially different from the left, and had remained so constantly, and that the animal continually limped on this leg, and always in the same way. A certain weakness and great tenderness is noticeable even to-day in the entire shoulder region, and especially at the spot at which the injury took place; the entire musculature on the humerus is also strikingly degenerate. The position of the injured leg (especially from elbow joint down) differs in a curious way from that of the uninjured left leg. The entire extremity has a fully crippled appearance. The apparently shortened forearm and foot of the right foreleg assume unmistakably a bow-legged position, and the entire extremity is strikingly bent inward.

The investigation of the limping young dog showed the following: In spite of careful feeling I could find on the right foreleg neither a sensitive place nor an abnormity of humerus or of the musculature; on the contrary, the right foreleg is externally completely similar to the left, but unquestionably different in posture and shape from the latter. While now in the father the right leg is "O"-shaped (bow-legged), and the foot is turned inward, the corresponding leg of the young dog shows exactly the reverse tendency in posture. It is rather "X"-shaped ("knock-kneed") and the foot is turned outward, but by no means so much as the corresponding foot of the father turns inward. The difference in the posture of the leg does not strike one so much when the two young dogs are observed together as when the father and the limping one are

compared along side of each other. In the usually very active movement of the animals, moreover, the difference in the posture of the legs does not become so evident as when the animals move slowly or stand still.

In judging this case it is to be noted, first of all, that the abnormality of the young dog which might be regarded as inherited (transmitted), does not agree in many particulars, especially in regard to the posture of the leg, with the acquired deformity of the father. There is, as it appears to me, a double interpretation of the case possible. Either one may assume that the abnormality of the young dog has appeared without any inheritance as a germ variation, which is not further traceable to its causes, and that a case of transmission has only apparently arisen, since by chance the paternal animal showed an acquired abnormality of the same leg as that on which, in the young animal, an abnormality arose by variation; or, on the other hand, one may regard the acquired abnormality of the paternal animal as the cause of the congenital abnormality of the young dog; in the latter event, it must be carefully noticed that the inherited peculiarity is very little similar to the original. Hence, there would be present only a certain influence, but not such a transmission as we perceived in the case of individual variations (blastogenic changes) in which the transmitted peculiarity differs, perhaps, in degree from the transmitting, but is always like it.

As far as the limping of the two dogs is concerned, I do not think that further significance can be attributed to this circumstance. To be sure, both dogs limp on the same leg—the father always alike, the son sometimes more and sometimes less, and often scarcely noticeably; thereby is by no means proved that the same cause lies at the bottom of the limping of both animals. As is well-known, quadrupeds, and especially dogs and horses, limp in consequence of the most varied causes, and it is often very difficult to find the real ground of the linping. In the case described, the limp of the father is evidently the result of the fall. I was as little successful as other investigators in finding the true reason of the trouble in the son, since nowhere on the entire body was a tender spot to be discovered.

The following case is so simple and characteristic, that no doubt can exist as to its interpretation. A Mr. S., a perfectly normal and well-proportioned man, had from youth up, the habit of turning the tip of his right foot outward more than that of the left, a circumstance which was especially apparent in dancing, and also showed prominently in foot-prints left in the snow or on moist ground. This peculiarity all his children (three sons) have inherited, only with the difference that in one of them, besides the right, the left foot also is turned out in a like striking manner. Since now the father of Mr. S., as a young man, acquired, in consequence of an apoplectic fit, apparent lameness of the right leg, as a result of which this leg was dragged behind, with the foot strikingly turned outward, one concluded that the peculiarity of the out-turned foot inherited from the older Mr. S. (i. e., a somatogenic character) had been transmitted to his son, and in still stronger measure to his grandchildren. As I stand in close connection with the family concerned, it was easy for me to acquire the necessary information, and I was able to establish the fact that the younger Mr. S. was already several years old when his father suffered the stroke, and further, that the elder Mr. S., from youth up, had complained of a certain weakness in the right leg, and that an important deterioration in the condition of the entire leg appeared directly after the stroke. If now one wishes to bring the out-turned foot of the younger Mr. S. in connection with the infirmity of his father, a thing which, according to my view, is not at all necessary, then it can be regarded as an inherited peculiarity in both the father and the son, i. e., a blastogenic, but by no means a somatogenic character. Such habits of peculiar postures of the foot not infrequently appear suddenly and without visible cause in some person or other, without a similar case having been known in the family of the same person. I also know a man who, from youth up, had the habit of continually turning the right foot in a striking manner inward, so that it was jocosely said of him he had two left feet; but neither in parents, brothers, children, nor other relatives of the man, has ever been noticed any special inclination to a striking position of the foot.

The third case which I shall now report came to my knowledge as in my own family, in consequence of the instance just described, the question of the transmission of mutilations was actively discussed. In that connection, this case was held up to me as an absolutely trustworthy proof of the possibility, yes, of the fact of such a transmission. The case is the more interesting since it is concerned with the apparent transmission of a scar ["Schmiss"—the term applied to the duelling scars of the German students.—*Trans.*].

A Mr. H. had received, as a student, a serious saber cut, extending vertically along his right cheek, and had retained, during his entire life, the conspicuous scar. Since one of the children of the gentleman, a daughter, brought into the world, exactly on the same spot of the right cheek, a birth-mark in form of a fine red slash, the length of the father's scar, no one hesitated to bring this birth-mark into genetic connection with the cut of the father; and since, in addition, among the five children of this lady, one son also possessed from birth an equally long birth-mark, exactly on the same spot as that of his mother, no one doubted an instant that the scar of the grandfather, an acquired (somatogenic) character had been transmitted to the daughter and the grandchild. Now so convincing as indeed this case appears at first glance, it is yet very far removed from furnishing actually indisputable proof of the transmission of mutilations.

In the first place, I should not neglect to mention that I have known the family in question for many years, without the peculiar inherited birth-mark of the lady or her son ever having attracted my attention, until I was called to notice, and could confirm its actual existence. With the lady, as with her son, the characteristic family mark had been very prominent in the early years of life, it then faded gradually, without disappearing completely, however. The elder Mrs. H., grandmother of the young man, is still living, and, according to her own account, has never possessed such a birth-mark on her right cheek; at present, every trace of one is certainly lacking, so that one is inclined to think of a transmission from the side of the grandfather, the elder Mr. H. Unfortunately, this gen-

tleman died many years ago, and it was on that account impossible for me to determine whether he also did not possess from his birth, such a mark on his right cheek, the existence of which was gradually forgotten,[5] especially, as on this cheek, the large scar and a number of smaller cuts were added.

Besides this possibility, there ought not to be left out of consideration the fact that not infrequently peculiar birth-marks are brought into the world by children, without the same or similar marks ever having been observed in the family in question or among relatives. That sometime such a mark could appear in some child exactly on the spot on which the father had had a cut, is, of itself, nothing surprising, or indeed strange. In a like sense Weismann has already expressed himself, before, indeed, such a case of apparent transmission of a scar had come to light. "I, indeed, do not wish to doubt," says Weismann, "that among the many thousand students whose faces are adorned by so-called cuts, one could be found sometime whose son has a birth-mark on the precise place on which the scar of the father is found. There exist many kinds of birth-marks; why not sometime, then, one exactly on the position and exactly in the form of a scar. Then we would have here a case such as the adherents of the doctrine of the

[5] How easily such birthmarks, especially if prominent only in early childhood, come to be forgotten, may be seen from the following incident: The young man in question, who, like his grandfather, fought left-handed, and has also carried off a considerable number of cuts on his right cheek and forehead, is now father of two children, who show no trace of the family mark. The young wife of the gentleman, whom, as a relative, I have known from early childhood, brought into the world on her brow and scalp a red mark, about 6 cm. long, whereas, among grandparents, parents, sisters and other relatives, such a birth-mark has never appeared. Gradually it has grown rather indistinct, and has come to be forgotten, especially since the "bang" of the child was combed down over the naturally peculiarly high brow. I have convinced myself personally that neither the brother nor sisters of the young wife, nor her husband and other connections, had a suspicion of the existence of the mark. Yes, that she herself knew nothing of it, and could be convinced of the actual presence of this mark only by the assurance of her mother who confirmed my indiscreet statements. At present, moreover, only a very weak, scarcely perceptible trace of this mark is to be recognized. If a child of this couple had brought into the world any birth-mark whatsoever upon the brow, this mark surely would have been brought in genetic connection with one of the cuts on the forehead of the father, since the congenital mark on the mother's brow had long since lapsed into forgetfulness. One would then, with great probability, have spoken falsely of the transmission of a scar.

transmission of acquired characters have long wished, a case of which they think that it alone would suffice to overthrow the entire structure of their opponents. But how far, then, would such a case, if it were really authenticated, be more in position to establish the kind of transmission asserted than the case related by v. Baer, the claim of *Versehen*[6]? I think there lies in the very extraordinary rarity of such cases, a strong indication that there is concerned an accidental, not a causal, occurrence. If cuts could really be transmitted, we should have to expect to meet very often such birth-marks corresponding to the paternal scar, in nearly all such cases, namely, in which the son inherited the features of the father."

From the preceding description we have seen that the apparently so convincing cases of the transmission of former injuries, which I have described, surely do not speak in favor of this theory, which requires nothing less than unimpeachable proof; they accord in part with the cases discussed by Weismann, in which direct proof could be furnished that the peculiarities in

[6] In passing, I should like to mention how prevalent the belief in the *Versehen* of pregnant women still even in so-called educated circles, and should like to relate, only as a curiosity, the following case which occurred also in a family of acquaintances. A Mr. X. went driving with his daughter, who was in the fourth month of pregnancy. By an unlucky chance the pet dog of the young wife fell under the wheels, and was terribly mangled. At the sight of the bleeding animal the horrified woman made involuntarily a movement of the right hand towards the *Kreuzgegend* and behold the timely born, completely normal child, had on the same region a large blood-red spot. Mr. X. assured me that neither in his family nor in that of his wife had a similar birth-mark ever appeared, and so all were agreed that this red mark of the child must stand in direct relation to the movement of the mother at the sight of the bleeding dog. I could only express to the family my warmest congratulations that the young wife possessed such great presence of mind, joined to tender motherly love, that she made the motion of the hand towards just that region, for if, as is wont to be the rule at horrible spectacles, she had covered her eyes with her hand, then the child would have had to bring into the world a peculiar facial ornament, something in the line of a blood-red nose. To go further into detail with regard to the impossibility of the *Versehen* of pregnant women, I regard as superfluous. It is sufficiently well-known that from the moment of the fertilization of the egg by the spermatozōon, the fate of the embryo is decided, both so far as its form as well as its individual *Anlagen* are concerned. Naturally, on account of the intimate connnection of the fruit with the mother, sickness which affects the entire organism of the latter, will also work detrimentally to the embryo, but neither beautiful nor horrible appearances on the part of the pregnant can produce the slightest change in the form of the embryo.

question do not at all correspond in the child and in the father or mother (parent, Weismann), and stand in no genetic connection.

The arguments which oppose the acceptance of the theory of the inheritance of mutilations, have been discussed so much in detail, especially by Weisman and Ziegler, that I shall not refer further to them here. The objections raised have by no means grown weaker of late; they have rather been considerably strengthened by new investigations which give us a deeper insight into the character and processes of fertilization (Weismann's Amphimixis). If now there is no doubt that in the acceptance of the transmission of mutilations, and of the other peculiarities acquired in the life of the individual, the phenomena of the theory of descent find a convenient and simple explanation, this condition by no means authorizes us to an unconditional acceptance of this supposition, since, as Weismann has shown, all phenomena of the theory of descent may also be explained just as simply and unconstrainedly without the aid of the Lamarckian principle. Of special importance for the decision of the question at issue are Weismann's much discussed experiments on mice. As is known, the artificial mutilations of these animals were carried on in both parents through many generations, without any apparent success. Similar recently published experiments of Ritzema Bos, as well as those of J. Rosenthal, showed also the same negative result. If now indeed these experiments on mice, as Weismann states with especial emphasis, alone and without further evidence, by no means furnish direct proof of the claim "that injuries cannot at all be transmitted, since such experiments must be prosecuted even to infinity: yet, indeed, after these unanimously negative results, the possibility of the transmission of single mutilations can be put entirely aside, and the [inheritance of?—*Trans.*] mutilations repeated on both parents through many generations, appear at least very improbable. I, as little as Weismann, Ziegler, and others, desire to doubt that modifying influence of external interference and stimulus on the germ plasm. One can be easily convinced of this, that change of climate, altered conditions of temperature, light and

moisture, different manner of nourishment, transform entirely unmistabably the organism of plant and animal, and there is nothing in the way of the opinion that by the continued working of such external influences and stimuli the molecular structure of the germ plasm also experiences a change which can lead to a transmission of the transformations. Above all, it ought not to be forgotten in this case that the somatic cells are in no way the first to be modified by the stimulus, and that then by some sort of unexplained process (Pangenesis, or intracellular pangenesis) this stimulus is transmitted gradually by these cells to the plasma of the germ cells. The influence on the germ plasm is rather a direct one, and if, by continued influence, a transformation of the structure of this plasm takes place and transmission occurs, then we have simply a transmission of blastogenic, by no means of somatogenic characters, and therein is not the slightest admission of the transmission of acquired characters.

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CERTAIN SHELL HEAPS OF THE ST. JOHN'S RIVER, FLORIDA, HITHERTO UNEXPLORED.

By Clarence Bloomfield Moore.

Fifth Paper.

General Conclusions.

STONE IN THE SHELL HEAPS.

It will be remembered that the district drained by the St. John's River is destitute of stone; the "rock" of the Indian River, which stream is closely approached by the St. John's near the headwaters of the latter, being a conglomerate entirely unsuitable for the manufacture of piercing or cutting implements.

It will be remembered also that in the shell-heaps of the river, even those giving evidence of greatest antiquity through absence of pottery, through infrequent occurrence of anything denoting the agency of man, and through other indications, implements of stone, though infrequent, have been found at all depths. Professor Wyman was present at the finding at the base of the shell-heap at Horse Landing, (Putman Co.,) of a piece of flint rudely worked, which he pronounced contemporary with the earliest stage of the mound. The writer realizing the importance of this discovery in a shell-heap in which, so far as Professor Wyman's and his own investigations have resulted, no pottery exists, twice visited Horse Landing and made a careful examination of the bluff. The flint in question was found in a section of a shell-heap laid bare by the action of the river, and the writer entertained the idea that the implement was possibly from the talus at the foot of the bluff, in which event the value of the find would have been materially lessened, if not entirely nullified. Fortunately, of all the shell-heaps of the river the composition of that at Horse Landing, most readily lends itself to an accurate estimate of the authenticity of objects found. Unlike the majority of the river shell-heaps, that at Horse Landing does

not rise from the level of the water, but is piled upon a bank of sand a number of feet above the river. All debris from the section laid bare falls a distance below the shell deposit, and an implement found embedded at a point in the sand where the shell begins is considerably above the debris from the section, and must, in the writer's opinion, have occupied that position since the foundation of the shell-heap.

During the investigations of the writer, which covered a period of upward of seven months during the years 1892--1893, steam motive power reducing to a minimum time devoted to transit, several hundred excavations were made in upward of eighty localities. But a small number of objects of stone were discovered under conditions positively identifying them as being contemporary with the construction of the heaps; a number entirely disproportionate, one would think, to the amount of material displaced.

Before proceeding to a detailed account of the worked stone found by the writer in the shell-heaps of the St. John's, it may be well to specify the nature of the conditions referred to above. The writer has had occasion to state in previous papers of this series that the shell-heaps were occupied as a place of residence by later Indians, and that some at least were cultivated by them. The maximum depth of a furrow in a shell-heap is eight inches, and it is probable that the rude implements of the Indians went no deeper. Allowing ten inches as a maximum deposit of surface loam since the final abandonment of the mound, a depth of eighteen inches is arrived at, lower than which it is necessary to go to insure a satisfactory identification as to the period to which any implement belongs.

If, however, sweet oranges are growing upon the shell-heap it is necessary that even a greater depth be attained. It is believed that the sour orange trees, so numerous upon many of the shell-heaps, are descended from sweet trees run wild, planted by later Indians from seed furnished by the Spaniards. Be this as it may a majority of the shell-heaps north of Lake Harney were until a comparatively recent date thickly covered with a growth of sour orange trees. It has been found in Florida that the most available orange trees are derived from

sweet budding upon sour orange stock. After this is accomplished it becomes necessary to place the trees in line and to remove many that no tree may be deprived of sunlight. For the removal of trees and for the "lining" of others, pits three feet in depth are necessary. It is well, therefore, to bear in mind that implements unquestionably of the shell-heaps must be found at a depth greater than three feet in sweet orange groves, and over eighteen inches from the surface in shell deposits not utilized for the cultivation of the orange. The writer, while handling the spade in an orange grove at St.

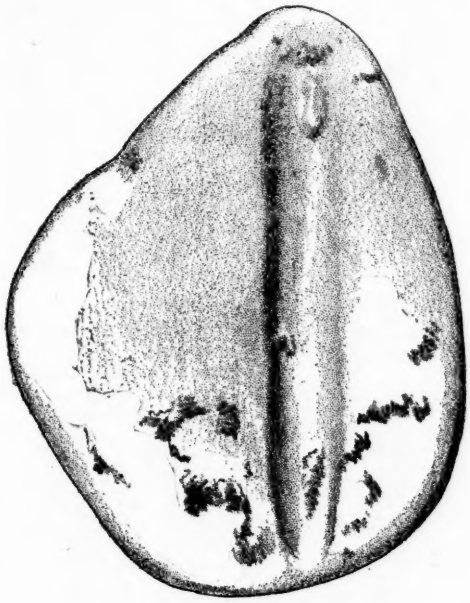


Figure 1.—Grooved Sandstone Hone. (Actual size).

Francis, found at a depth of three feet a thin and beautifully proportioned arrow head, evidently of the time of the later Indians, and conversely he has seen upon the surface in orange groves, arrow points unquestionably of the time of the shell-heaps.

Stone implements known as "sinkers" have never been met with by the writer other than superficially, though hones of sandstone with grooves worn by the friction of pointed tools were contemporary with the later heaps at least. Fig. 1 is from Turtle Mound,[1] Brevard Co.

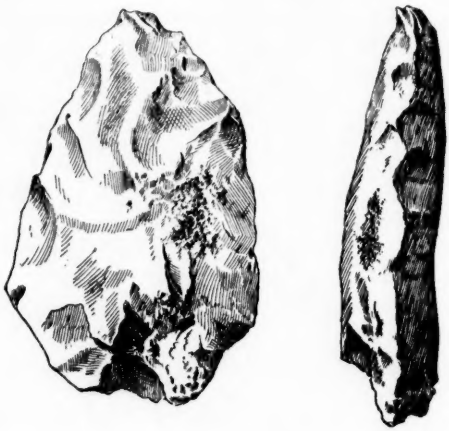


Figure 2.—Arrow Head, Morrison's Creek. (Actual size).

Figure 3.—Arrow Head, Mt. Taylor. (Actual size).

No grooved axes are known to have been found on the river under any circumstances.

[1]Not the great marine shell-heap near New Smyrna.

During the entire investigation of the writer but one implement in any way resembling a chisel or hatchet was brought to light, that could positively be ascribed to the period of the

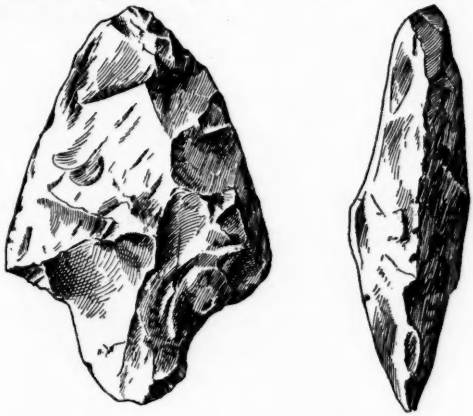


Figure 4.—Arrow Head, Ginn's Grove. (Actual size).

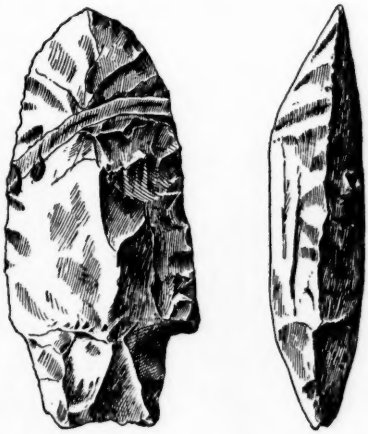


Figure 5.—Arrow Head, St. Francis. (Actual size).

shell-heaps. This was an implement of polished greenstone figured and described in the AMERICAN NATURALIST, August,

1893. This object, the only one of polished stone known to belong to the epoch of the shell-heaps of the St. John's, was found at a depth of $4\frac{1}{2}$ feet from the surface in Mulberry Mound, Orange County, which is believed to be one of the very latest shell-heaps of the river.

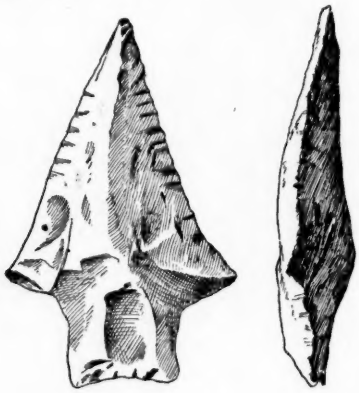


Figure 6.—Arrow Head, shell-heap near Puzzle Lake. (Actual size).

Figure 7.—Arrow Head, Bryson's Mound. (Actual size).

ARROW AND SPEAR POINTS CONTEMPORARY WITH THE SHELL HEAPS.

FOUND IN PLACE BY THE WRITER.

1.—Two arrow heads of chert from the swamp shell-heap near Morrison's Creek, (Volusia Co.,) lying on fire-place four feet eight inches from the surface.[2] Of these, one is figured (Fig. 2). Though carried to a depth of nine and one half feet, this excavation showed no pottery below two feet from the surface.

2.—Two arrow heads of chert and one of chalcedony from the great swamp shell-heap near Volusia, known as Mt. Taylor, (Volusia Co.,) respectively four and one-half (Fig. 3), six and one half and eight feet from the surface. All three lay upon fire-places. A careful search in many parts of this shell-heap showed no pottery whatever.

3.—One arrow head of chert at Ginn's Grove, (Orange Co.,) five miles south of Sanford, at a depth of two feet (Fig. 4). No orange trees grow on this deposit. No pottery found in it, though comparatively abundant in an adjacent shell field.

4.—One arrow head of chalcedony at a depth of six feet on a fire-place in the crescentic shell-heap at St. Francis, (Old Town), (Lake Co.,) (Fig. 5). Many excavations showed no pottery below four and one half feet from the surface.

5.—One arrow head of chert six and one half feet from surface on fire-place in shell-heap west side of Puzzle Lake, (Orange Co.,) (Fig 6). No pottery found below a depth of two feet.

6.—A fragment of spear head of chalcedony at Orange Mound, (Orange Co.,) about twenty-one miles by water

[2]It will be seen that a majority of the arrow heads were found immediately upon fire-places, and of the remainder, the writer is unable to state that such was not also the case. With some were the bones of lower animals. It has been suggested to the writer that as it is unlikely that weapons so comparatively scarce as were arrow points at the period of the shell-heaps, should be lost without some reason, the stone points met with by him were thrown on the fire-places buried in the carcasses of animals. This seems a not unlikely hypothesis.

south of Lake Harney. Deep and numerous excavations gave no pottery below seven and one half feet.

7.—One arrow head of chalcedony in Bryson's Mound, (Volusia Co.,) (Fig. 7). This arrow head was not found when thrown out, but as it lay among material belonging to a stratum not seen within three feet of the surface, its depth may be set down at from three to five and one half feet. Sour orange trees only.

8.—One spear head of bluish chert in the shell-heap on Salt Run, Lake George, (Marion Co.,) at the bottom of the heap three and one half feet from the surface. No pottery found anywhere in this shell-heap below surface loam. No orange trees.

9.—One arrow or spear head of hornstone beveled on both sides 2.34 inches long with maximum thickness of .47 inch, four feet from surface in conical shell-heap in swamp one mile north of Astor, (Lake Co.,) near fireplace. No pottery discovered in this mound beneath surface loam.

10.—Three lance heads about fourteen feet from surface in Mulberry Mound, (Orange Co.). Two of fine chert, thin and of graceful pattern; one of somewhat ruder workmanship fashioned from coarse, yellow chert. These lance points have been described in a previous paper and many reasons adduced why Mulberry Mound must be considered among the very latest of the shell-heaps. Ornamented pottery was found to water level.

As will be seen by the figures, the arrow heads of the presumably earlier shell-heaps are rude in type. They are also characterized by unusual thickness.

Stone implements of the St. John's River are distinctly neolithic, though Professor Wyman in error characterized certain rough specimens found by him as of the St. Acheul type.[3]

The writer has submitted to Professor Haynes a representative collection of rude chipped implements of various sizes, presented to him and reported as coming from the shell-heaps by owners of orange groves and other responsible persons.

[3]Fresh Water Shell Mounds of the St. John's River, Florida, page 49,

These implements Professor Haynes carefully studied, and writes af them as follows:

"No one of them, in my judgment, resembles the genuine paleolithic implements of western Europe, and I am no believer in any paleolithic period in North America different from that of the old world. By this I mean a time when man was living in some regions as the contemporary of animals, now extinct or migrated to colder countries, like the mammoth and reindeer, and had for his principal tool a type of stone implement peculiar in its shape and method of fabrication and of use. Such implements also show upon their surface characteristic indications of their great antiquity. I think genuine paleolithic implements, so understood, have been discovered in the United States, but yours do not fall within that category, in my opinion, although they somewhat resemble them in shape. But so also do many objects found all over our country which must, nevertheless, be classed as rude, or unfinished Indian implements, although they have been supposed to be like genuine paleolithic implements, by some persons not sufficiently informed upon the subject."

FOOD SUPPLY.

While dredging for specimens of modern shells in the lakes, creeks and lagoons in the neighborhood of the St. John's River, the writer had ample proof that the supply of paludinæ is greater at the present time than has previously been reported. Whole lake bottoms are covered with them, while they are found in abundance in numerous creeks and lagoons. The writer knows by experience that the ampullaria and the paludina make a nourishing and not unpalatable soup. Still it is probable that the aborigines varied their diet to as great an extent as possible. Bones of the dog, the red lynx and a member of the sheepshead family of fish, hitherto unreported as articles of diet, were discovered in shell-heaps by the writer.

It is difficult to arrive at a conclusion in respect to the bison, known to have inhabited Florida within a period of which there is historical record. No bones belonging to this animal were found by Professor Wyman, nor has the

writer succeeded in discovering any. A molar, identified by Professor Cope as belonging to a bison, was presented to the writer by Mr. C. H. Curtis of Bluffton, Volusia Co., who stated that it had been superficially found on the shell deposit at that place. It is possible that future investigation will show the bones of the bison to be present in the shell-heaps of the St. John's. Their presence in those of Georgia has been noted.[4]

While the remains of various fish are found in the shell deposits they are by no means so numerous as might be supposed considering their great abundance in the river. The absence at any considerable depth of "sinkers" of stone, believed to have been used for cast-nets, as has been stated, seems to indicate their use as confined to the close of the shell-heap period. Nothing in any way suggesting a fish hook has ever been found in the river heaps. It is probable that the main supply of fish was obtained through the medium of the spear, a method known to have been practiced by later Indians.[5]

AGE OF THE SHELL HEAPS.

There seems to be no reason to doubt that a wide divergence in time characterizes the construction of the shell-heaps of the river, and that many were completed before others were begun. Mt. Taylor, Volusia Co., has a maximum height of over 27 feet. Many and considerable excavations made in every part with an adequate force of men have failed to reveal a fragment of pottery beneath the surface loam. The removal of the entire heap (a work of months) could alone afford absolute proof, but the result of repeated excavations is a strong indication of absence of pottery in the mound.

Mulberry Mound near Lake Poinsett, an island shell-heap rising 16 feet above the water level, is composed of crushed shell and sandy loam, showing slow growth beneath the tread of its inhabitants. Ornamented sherds were met with to the very bottom. Colored pottery was found, and an article of personal adornment, while on a preceeding page has been

[4]C. C. Jones "Antiquities of the Southern Indian," page 200.

[5]The writer has found iron fish spears near the surface of the sand mounds.

related how graceful weapons lay near the base—weapons entirely at variance with the pattern of those of presumably older mounds. The men who dropped the first unios on the low marsh where Mulberry Mound now stands, probably came long after the aborigines abandoned Mt. Taylor. One can readily realize, then, that the shell-heaps are by no means contemporary, and that the beginning of the earliest must date from a period comparatively remote, not, so far as any proofs exist, from a time approaching that of the great mammals, but one far antedating the coming of the whites.

Since the appearance of the first paper of this series, the writer has (1893) carefully gone over many shell-heaps included in his first paper, and has added to the list a considerable number from seven localities. With a force of eight men to handle the spades, the writer has in addition carefully examined nearly all the shell-heaps described by Wyman, and in none has he found any indication of intercourse with Europeans, in this result coinciding with the researches of Professor Wyman.

Numerous objects found by those having shell-heaps under cultivation have been described to or inspected by the writer, but in no case has there been any evidence of the discovery of anything suggesting other than the product of unaided aboriginal industry.

History is singularly rich in accounts of the manners and customs of the natives of Florida, beginning at a period not long subsequent to the landing of Columbus. In all these accounts, written with scrupulous regard for detail, there is nothing to indicate the existence of native races so low in the scale of humanity as must have been those who piled up the greater portion of the shell-heaps. We are told by the Knight of Elvas[6] of the superior quality of the pottery of the Southern Indians. We look in vain in the shell-heaps for evidence upon which such an assertion could have been based. In the face of such a mass of negative evidence, unless proof to the contrary be adduced, the shell-heaps must be considered as abandoned in pre-Columbian times.

A point brought forward in the initial paper of this series

[6]Cited by C. C. Jones "Antiquities of the Southern Indians," page 445.

for the sake of emphasis will be repeated here. In certain shell-heaps at various depths from the surface fragments of pottery, which have gradually been decreasing in number, entirely disappear, indicating, in the writer's opinion, the inception of the manufacture of pottery during the progress of the erection of the heap. The absence of pottery cannot be accounted for under the hypothesis of decay, since no stratum containing partially decayed sherds is met with in any of the river shell-heaps. If the occurrence of shell-heaps devoid of pottery is admitted on the St. John's, and as to this a careful investigation can leave no doubt, it would be difficult to assign a reason for the absence of this necessity of aboriginal life, save ignorance of the method of its manufacture,[7] and assuming this to be the case, there would seem to be no cause why certain shell-heaps should not show by internal evidence the inception of the art.

In conclusion, the writer would state as his opinion, that while the shell-heaps of the St. John's have been imperfectly explored, and while many interesting questions still remain unanswered, but little work will be done in connection with them in the near future. The territory to be covered is so vast, and the shell-heaps of the upper river are so inaccessible that one may well hesitate before undertaking an exploration involving so much trouble and expense. Moreover, but little is found in comparison with the vast quantities of debris to be handled, and the relics of the wretched makers of the shell-heaps offer but a poor incentive in comparison to the more alluring results to be attained in other portions of the country.

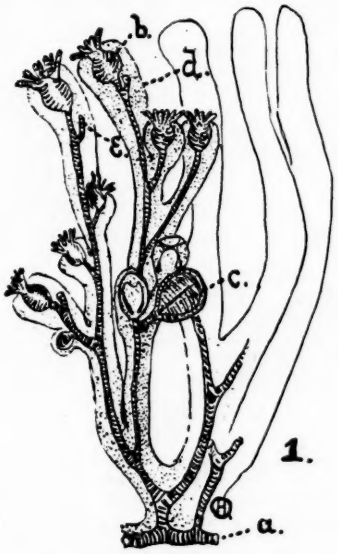
[7]It has been asserted that the absence of pottery in certain shell-heaps is explainable under the hypothesis that the people frequenting the shell-heaps dwelt there for but a portion of each year and made the earthenware vessels elsewhere. This seems untenable. It matters little where the pottery was made. If possessed by the occupants of the shell-heaps it certainly would be *used* there, for numerous fire-places and broken bones at all depths testify to culinary pursuits. Earthenware is too brittle to allow one for an instant to suppose that numerous vessels would not be broken as they were on so many shell-heaps. Moreover it is difficult to comprehend why some shell-heaps should be marked by the manufacture of earthenware, while others give no evidence of its production. Rude masses of baked clay and in one case a vessel filled with clay unbaked were found by the writer in shell-heaps.

The conclusion seems difficult to escape that where earthenware is not found, its manufacture was unknown.

PERIGONIMUS JONESII; A HYDROID SUPPOSED TO BE NEW, FROM COLD SPRING HARBOR LONG ISLAND.

By Henry Leslie Osborn and Charles W. Hargitt.

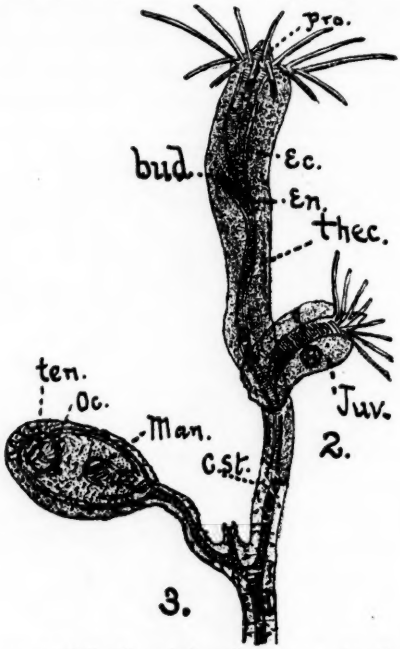
The authors of this article, while engaged in seaside studies at Cold Spring Harbor, at the Laboratory of The Brooklyn Institute, found a certain hydroid which is the subject of this



article. A careful survey of the accessible literature of the subject has failed to demonstrate that it has been previously described, though its very common occurrence together with the ease of its capture render it remarkable that it should have escaped the hands of the collector heretofore. It is a very interesting species on account of the very primitive state of development of the integument, if we may so call the theca or skeleton, and hence of interest to the biologist, for whose sake,

rather than merely for the sake of its faunal interest, these notes are written.

The species occurs very commonly as a flesh-tinted scum on the abdomen or on the tips of the joints of the walking legs (pereiopods) of the Channel Crab *Libinia emarginata.* This crab lives abundantly a very lazy life in the deeper waters near the mouth of Oyster Bay and in the bays and sounds gener-



ally that connect with the Atlantic Ocean in the latitude of Long Island. If specimens of the crab be placed immediately upon capture in an aquarium, the hydroid, if present, can be seen as a fleshy fuzzy mass in the midst of the rather abundant hairy material that covers the creature on the ventral surface quite generally. The hydroid is thus a messmate of the crab, but there is no proof that I know of that the latter is in any way affected by the presence of this lowly companion. There is a disease of a certain fish caused by the presence of a parasitic hydroid described by Fewkes as *Hydrichthys mirus*

[Bull. Mus. Comp. Zool., Vol. XIII, p. 224]. In this case however, it was not certain that the parasite did any damage to the fish. It is not impossible that a hydroid could get into such a relation to the soft tissues of a crab at the joints as to be a harmful resident there, but we know of no proof that such is true of *Perigonimus jonesii*.

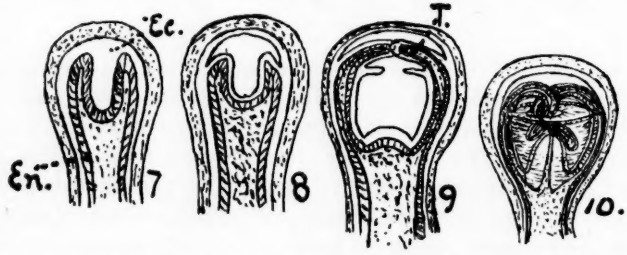
An examination of the colony with the low power shows that it is a very much branched mass of stalks arising from stolons that ramify on the surfaces offered by the shelly outer covering of the host. The colony is, unlike most of the other species of this genus, very closely and luxuriantly branched, and the two kinds of persons are both carried on the same stalk. The stalks are terminated with one oldest zooid and below it are the younger ones and the gonozooids. The hydriform persons or hydrozoids are, as shown in figure 2, only slightly differentiated into a body separate from the stem and in this respect it is of the more primitive hydroid form. The tentacles are not numerically constant but are about sixteen in number. They tend, when fully expanded, to assume an alternately reflexed position. They are confined to a single row at the base of the

proboscis. This is also a primitive character. The stem just at the base of the body proper of the hydrozooid bears a little bud not sufficiently developed to project beyond the outline of the cuticle. The interesting thing about this hydroid to the biologist is the very primitive condition of the external skeleton. This is a gelatinous investment that covers the stem and the body in every part. It is so soft and flexible that it follows all the movements of the body and stem without any apparent resistance. This cuticle reaches upon the body to the level of the tentacles to which it is fastened, as is shown by the fact that it is moved about with them as the animal waves them to and fro, and it is retracted with them as the proboscis is drawn

down to the slight extent that is possible to the animal. The covering is of the most delicate texture but strong enough to hold firmly together in all the movements of its possessor. In the older parts the cuticle is somewhat more opaque and is more or less stuck up with dirt and such things.

The gonozoids are budded in clusters from the sides of the stem near its centre, they have an investment of cuticle which entirely covers them, and the bell develops to its time of release but not to its maturity in this case, and can then be seen to break off from the parent stock and swim away for itself. The stages in the development of the bell are as usual in this order. They are as follows. It appears as a minute bud on one side of the stalk, and not for some time can it be seen whether it is to give rise to a medusa or to a polyp. An enlargement into a somewhat spherical head usually indicates the medusoid character of the bud. This process is quite gradual as may be seen from the figs. 4, 5 and 6, all of which, while somewhat diagrammatic, were sketched directly from living or preserved and mounted specimens. As has been said, they follow the general course of development common to the order. *Cf.* Lang, Comp. Anat., p. 105, *et seq.*

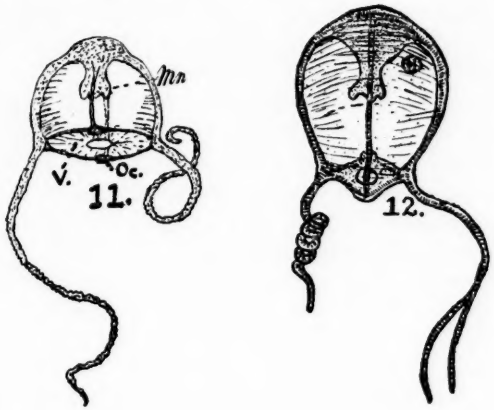
The first differential change that occurs is a thickening of the peripheral ectoderm at the extremity of the bud, with an accompanying invagination extending to the entoderm; fig. 4. This continues as shown in figs. 7 and 8. In this process



there occurs what may be designated as a cleavage of the ectoderm of the outer margin of the bud, and which extends for some distance around the bell, fig. 8. The outer portion constitutes the outer ectodermal envelopes of the medusa, and is ruptured and finally atrophies at, or immediately before, the

final separation of the medusa. The inner layer of the ectoderm continues to invaginate, making the ectodermal lining of the bell, and giving rise to the tentacles and velum. *Cf.* figs. 9 and 10.

From a glance at figs. 11 and 12, it will be seen that the



11.

12.

tentacles are relatively very long, but in mature specimens they are much longer than represented. Their disposition during the period of development is quite interesting. It is measurably indicated in fig. 9. They are from the first turned inward and soon enter the interior of the bell, being nicely folded and filling the entire cavity. This habit is not abandoned immediately on the separation of the medusa. In many cases under observation the medusa, when suddenly disturbed, would at once contract the tentacles, and, seeking the mouth of the bell, dispose them within, and at the same time assume an almost spherical form and thus remain for some time or till the disturbance ceased.

The development of the radial and circumferential gastric canals proceeded, *pari passu*, with the growth of the medusa. This was very easily demonstrated by the active circulation which was observed extending to the very tips of the tentacles and over the middle of the bell to unite with the circumferential canal at the optic spots. No special histological investiga-

tions were made, but it seemed highly probable that the canals arose after the manner described by Lang, (*op. cit.* p. 73.)

The development of the manubrium calls for no special account. Its origin is illustrated in fig. 9, it is also shown in fig. 3.

The origin of the mouth is simply through the rupturing of the terminal walls of the manubrium, and was observed in several cases, and seems to be after the method common throughout the order so far as known.

There is not the least difficulty in obtaining the young medusa or in keeping them alive in aquaria for a considerable period of time. We had them as long as fifteen days and examined them constantly, but we did not succeed in rearing them to maturity. At the time of their liberation from the hydroid stock the reproductive organs had not yet made their appearance.[1] Perhaps a later study of this creature will disclose a way in which this important link in the life history can be discovered. Until this important fact, the definitive form of the medusa, is supplied, the generic affinity of the species must remain in uncertainty. There are indications enough, however, to justify its provisional assignment to the genus Perigonimus of Sars. Not only are the structure of the hydroid stage and the structure of the young medusa, in favor of this, but this species shares with nearly all of the remaining members of the genus the habit of commensalism. Thus *P. repens* is found on the shells of the hermit crab, *P. minutus* lives on the shells of Turritella, *P. vestitus* is attached to the shell of Buccinum, and *P. repens* is reported from the shells of Libinia in the British Islands. The form we are now considering, while it is generically related at least in the hydroid and early medusoid stage to the Genus Perigonimus, is not, so far as we have been able to learn, specifically related to any described species. We have, therefore proposed to give it the name *Perigonimus jonesii*, to commemorate the founder and constant friend of the Cold Spring Biological Laboratory, Dr. Jones. The great luxuriance

[1] In one instance, figured in No. 12, one of the tentacles was bifid. It was distinctly double from the point of its origin and was plainly a monstrous character rarely found. Each portion of the tentacle was moved independently but both tended to be retracted together on stimulation.

of the branching, together with the origin of the medusæ from the stalks bearing the hydroid members, and the presence of several medusæ originating at a common point of attachment to the parent stem are the specific characters that have required the erection of this new species.

For convenience the species of the genus are summarized here.

P. repens, tentacles all erect, about 18–20, medusæ and hydroids simple, arising separately from a creeping hydrorhiza, young medusa bi-tentaculate.

P. minutus, tentacles 7, medusæ arising from the simple or very sparingly branched hydroid persons, on shells of Turritella.

P. vestitus, tentacles 8, alternately reflexed, medusæ arising either from the hydrorhiza or from the hydroid person, not in clusters; hydroids not branched, young medusa bi-tentaculate, On shells of Buccinum.

P. palliatus, tentacles, 8 alternately reflexed, thick gelatinous coat as far as the bases of the tentacles, gonophores arising from the hydrorhiza. On shells of the hermit crab.

P. jonesii, tentacles 16, alternately reflexed, thick gelatinous coat as far as the bases of the tentacles; medusæ and hydroids on the same stalks, hydroids luxuriantly branched and mudusæ clustered, young medusæ bi-tentaculate. On shells of Libinia.

To the morphologist a form like the one just described has peculiar interest because of the many primitive characters which are united in it. It is not improbable that the higher calyculate Campanularian Hydroids may have been descended from athecate ancestors that were more or less closely like the genus Perigonimus. This is a very lowly form of the tubularians, having only a single row of tentacles, the mode of reproduction is very simple, and the medusa is of a most simple character. Still while Perigonomus is treated among the naked hydroids, it has a covering. This covering is such a one as such an animal as the naked hydroids might have in their earlier stages of the acquisition of a strong skeleton. It is not a highly differentiated product, but a delicate, hardly compacted slime not very unlike the mucous secretions that all

animals are so commonly throwing off from their bodies. If the semi-fluid coat of this sort were stiffened only a little, we should arrive at the more compact chitinous cuticle of the calyculate forms. The case of Perigonimus thus furnishes a suggestion of the probable history of the chitinous cuticle of the hydroids; at first a thin envelope, later a stiffened cover forming a greater protection to the body and providing for freedom of motion by the development of joints at stated intervals. The facts of ontogeny are in favor of such a view of the history of the cuticle, for we know that the cuticle arises as an excretion thrown off from the ectoderm and hardened on exposure to the water. And the differences between the gelatinous and the chitinous cuticle, are such differences in the chemical or metabolic functions of cells as could conceivably easily come within the range of operation of natural selection. It is of great interest then to find so primitive an animal with so primitive a mode of skeleton building, and whether the creature is really a primitive one or its primitive characters are only secondarily acquired it is one the entire life history of which would be full of interest.

EXPLANATION OF THE FIGURES.

Fig. 1.—View of general mode of branching and situation of medusæ. *a* hydrorhiza; *b*. hydroid person; *c*. medusa bud; *d*. the gelatinous cov. *e*. a young hydroid bud.

Fig. 2.—Enlarged view of the terminal zooid showing the body, "ec," "en;" and the covering "thec;" the proboscis, "pro;" and a younger zooid, "juv."

Fig. 3.—View of a single one of the medusæ in position. *c. st*, the stem of the colony; *man.* the manubrium inside the bell; *oc*, the eye-spot at the location of a tentacle; *ten*, a tentacle.

Figs. 4, 5, 6, 7, 8, 9, 10, different successive stages in the growth of the medusa.

Fig. 11, a medusa just freed from the colony; *mn.* manubrium, *oc*, ocellus; *v*. velum.

Fig. 12, view of an exceptional specimen showing bifurcated tentacle.

Hamline, Minnesota, July 19th., 1893.

COURTSHIP AMONG THE FLIES.

J. M. ALDRICH.[1]

The dipterous family Dolichopodidae perhaps surpasses all other families of animals in the variety and complexity of the sexual adornments of the males. These structures occur in some species in the tarsi, in others in the antennæ, face, wings, or other parts. Probably three-fourths of the species offer well-marked peculiarities which distinguish the male at a glance.

In the genus Dolichopus, the males are usually provided with tarsal ornaments, usually on the fore limbs. A new species, to which the following remarks apply, has the fore tarsi in the male exceedingly elongated and slender, with the last joint in the shape of a comparatively large, oval, black disk. In none of the numerous other species known to me is the attenuation of the first three joints so great. The tarsi of the female are of the ordinary simple structure.

This species is abundant about the edges of the streams, on the wet, bare earth, at Moscow, Idaho. I observed in September the maneuvers of the male in courting the female. He would place himself directly in front of her, at a distance of about half an inch, with his face toward her. He would then rapidly vibrate his wings, holding them horizontally, at right angles to the body, and at the same time would give these fore feet an up-and-down motion, raising them simultaneously above the level of the head and bringing them down with a slight force upon the ground, the movement recurring in a measured way in about half a second. This he would continue for some ten seconds; then, rising on the wing, he would swiftly make a small semicircle in the air and attempt to alight upon the female. In the large number of cases that I observed, he was always unsuccessful, the female hastily movaway a few inches, when the male would usually alight before her and repeat the movements just described. On account of the numbers that were engaged in this occupation on the same small area, I could not be certain that the same male always

[1] Moscow, Idaho.

attended upon a given female; but there can be no doubt that the females are exceedingly slow to accept the males, for I saw the above maneuver repeated hundreds of times with the same result.

In company with the species just mentioned occurred considerable numbers of a species of Hygroceleuthus, which I have referred to (Kans. Univ. Quarterly, II., 24) as a variety of *H. crenatus* O. S. These were engaged in a similar occupation. The male of this species has only plain tarsi, but differs from the female in having the antennal joints longer, the first two with coarse black hair, and the arista of the third short and heavily covered with black pubescence; the face is also longer, the wings broader, and the cilia of the tegulæ, instead of being coarse and chiefly black, are fine and white. The male hovers in the air before the female at a distance of one or two inches, occasionally making a slight darting motion towards her. In this position the peculiarities of his face and antennæ are shown to the best advantage. The breadth of the wings is probably of advantage only in facilitating this hovering process, and the structure of the tegular cilia may possibly be accounted for by supposing that it is simply in compensation for the increased growth of wings. This male, after hovering a few secends, describes a semi-circle in flight and attempts to alight upon the female as in the foregoing species, and with the same results. I observed the copulation only once, and then did not see the preliminaries.

I was much impressed by the perfect coincidence of these observations with Darwin's theory of sexual selection. The reluctance of the females, and the corresponding ardor and persistence of the males, is carried to an almost incredible limit.

In this connection the observations of Fr. Dahl (Zool. Anzeig., April, 1889) on another species of Dolichopus are of interest. I translate from a quotation in an article by Dr. W. M. Wheeler (Proc. Wis. Nat. Hist. Soc., April, 1889, p. 209), which mentions a somewhat similar habit in a gall-gnat *Asynapta antennariæ* Wheeler).

"The male species of fly, *Dolichopus plumipes* posseses on first tarsal joint of the middle legs a beautiful, regular fringe,

the purpose of which is not immediately perceptible, as the flattened hairs could not possibly serve to grasp the female. I have now observed the pairing of these insects, and am convinced that the structure serves as an actual ornament to the male, like the highly developed tail-feathers, etc., of a male bird. The male came flying up, and hovered for a time so close over the quietly-resting female that the fringed tarsi hung down immediately before her eyes. After some time copulation was attempted, but the female at once showed unwillingness. Only after repeated attempts did he succeed in gaining her acceptance."

EDITORIALS.

—THE edict of the Czar whereby the town of Dorpat is hereafter to be known as Juriew, and its university, where heretofore the lectures have been in either German or Russian, is to be thoroughly Russian now, suggests a question which is rapidly becoming a serious one to the scientific world outside of Russia. This is, what shall be done with the numerous papers published in the Slavic tongues? It is a serious task for the student to acquire a reading familiarity with the various Teutonic and Latin languages. Russian, Czech, and Polish, are almost impossible. And yet the tendency on the part of the Russian Government is to compel the exclusive use of that tongue. It is hereafter to be the language of all publications coming from the University of Juriew. Must the student of science hereafter add a knowledge of Russian to his other linguistic attainments? or is he justified in neglecting all Sclavic productions, just as he would those in Japanese, until they are translated into one of the languages previously in scientific use? Cannot our various International congresses discuss the question as to what languages shall be recognized as the proper vehicles for the publication of the results of research, and come to some agreement whereby all papers printed exclusively in languages outside those of the Teutonic and Roman stocks are to be regarded as not published. Protests by the Western World are of no avail with the Czar, but the fact that the difficulty is such as to produce a practical boycott may produce good results.

Since writing the above a case to the point has arisen. In the last number of the "Morphologisches Jarbuch" the brilliant embryologist, Goronowitsch, takes Miss Julia B. Platt to task for ignoring previous literature. The facts are these. Miss Platt announced that the cartilages of the vertebrate head are ectodermal in origin, and in support of her views she quoted from the available literature, including one paper by Goronowitsch. Mr. Goronowitsch complains that she neglected two other papers by himself, one of which was in Russian.

—THE city council of Philadelphia made an appropriation for the purpose of securing certain collections of objects of Natural History which were exhibited at the Exposition at Chicago. The matter was placed in the hands of Professor W. P. Wilson of the University of Pennsylvania, who carried out the object of his mission successfully, as he has

obtained a large amount of valuable material. It is now proposed to erect a building for the purpose of accomodating the collection. To this proposition it may be objected that we have already in Philadelphia a sufficient number of buildings adapted to museum purposes, so that to erect a new building is to divert money from a more important object, viz., that of securing the care of the specimens, and their use as means of scientific research. The expenditure of money for museum buildings has secured enough space and shelter for the materials of research and for the investigators for a long time to come, so that the endowment of scientific research should now claim attention. An appropriation for this purpose would be of more utility than any other that can now be made, for it has been a necessity in the community for a long time. Scientific results can not be expected without provision for investigators, and this is lacking in almost all our institutions.

—Two prizes have been offered by a member of the Anthropological Society of Washington for first and second essays which shall contain a definition of the "Most useful citizen of the United States regardless of occupation." In our next number we will give the details of the plan in full. Such a definition may be summed up in a few words, or it may cover the fields of social and political science. We shall look with much interest to the responses which this offer shall bring out. Men's ideas of the highest utility are various, and, they differ as well in regard to utility in detail. Many persons possess a bias in favor of their own pursuits, which is natural. So far as this project encourages thought, and stimulates serious endeavor, it will be itself of no small utility.

—We must again request our **correspondents** and **exchanges** to send M.S. and printed matter of all kinds, except proofs, to the office of the editor 2102 Pine Street, Philadelphia. We except of course such as are designed for the use of our Editors of departments. This course expedites their reception and acknowledgement at all times; and when we change publishers as we occasionally do, such matter is apt to be lost.

RECENT BOOKS AND PAMPHLETS.

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RECENT LITERATURE.

The second and concluding part of J. Roth's Allgemeine und Chemische Geologie[1] completes the valuable set of volumes the first two of which have proven such a boon to chemical and petrographical geologists. That portion of the volume before us has been edited by the author's daughter, who has attempted to present the subject matter contained in it as nearly as possible in the form in which it would have appeared had her father lived to complete his work. The title of the book describes the nature of its contents. The discussion relating to the weathering of rocks comprises 59 pages, on many of which are found analyses that serve to illustrate the subject. Seventy-two pages are devoted to the decomposition of rocks through the influence of volcanic and other examinations from beneath the surface of the crust and thirty-two pages deal with rock distintegration consequent upon temperature changes, the action of organisms, and the effects of wind and water. Three appendices to the three volumes follow, and to each there is added an excellent index. The brochure just issued, like all the others that have come from the pen of its author, is a masterly and thorough treatment of the subject of which it treats. It is a fitting capstone to the excellent monument which the authors reared to himself during the concluding years of his life. It is so replete with interesting information that it must prove a necessity to every student of rocks. W. S. B.

Our Household Insects.[2]—Under the title Mr. Edward A. Butler has written a book which is decidedly better as regards accuracy coherence and scientific value than the usual popular works on entomology. Eighteen chapters are utilized to discuss a great variety of household insects—many of which in America at least could only rarely be viewed in the light of "pests": the list includes wood boring, club-horn and long-horn beetles, meal-worms, ants, wasps, horn-tails, clothes moths and meal moths, crickets and ear-wigs, flies of many kinds including gnats, midges and mosquitoes, the flea and bed-bug, the book-louse and "silver-fish" and lastly human Pediculi. Besides a consider-

[1] Allgemeine Geologie, von Justus Roth. 2te Abt. Verwitterung, Zersetzung und Zerstörung der Gesteine. Nachträge. Berlin. W. Hertz., 1893. Pp. 211–530 and ix.

[2] Our Household Insects: An Account of the insect pests found in dwelling-houses. By Edward A. Butler, Longmans, Green, and Co.

able number of fair illustrations in the text, there are seven page-plates showing photographic enlargement of various insects.

Horns and Hoofs[3].—This octavo volume of 411 pages is a reissue in a collective form of articles which have appeared from time to time in the *Field* and *Land* and *Water*. The animals come under the designation of "big game," and include the wild oxen, sheep and goats, the Asiatic and African antelopes, the Asiatic and South American deer, the wild pigs, and the rhinoceroses, ancient and modern. In some of

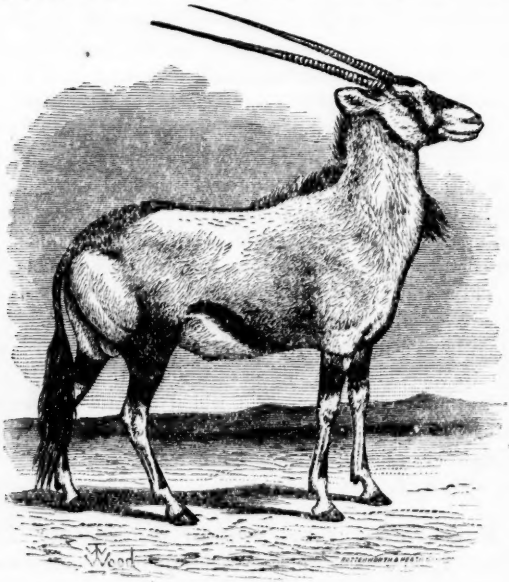

Fig. 1. *Oryx gazella*, the gemsbok of Africa.

the chapters all the members of particular groups are discussed, in other cases, while the geographical distribution of all given, the author limits the full description to the more important members. The relations existing between the different groups and the past distribution of each particular group are treated of more at length than is customary in the majority of sporting works. In fact the book rises much above the general level of this class, as it could not fail to do as the work of Dr. Lydekker, who is one of the most competent of modern zoologists.

[3] Horns aand Hoofs or Chapters on Hoofed Animals. By R. Lydekker. Horace Cox; The Field Office, Windor House. London, 1893.

His long residence in India gives him especial authority on the Mammalia of that region, and we accordingly find his descriptions of some of the little known species of the oriental mountain ranges to supply a long feet desideratum. These remarks are especially applicable to the wild species of sheep and goats. We find the work lacks symmetry in the inclusion of the rhinoceroses while it omits the tapirs and horses; and a strictly scientific limitation would include also the Proboscidia. Perhaps these forms can be added in a future edition. In any case it is a book which no sportsman or naturalist can not be without. It is illustrated by 82 excellent cuts. Through the courtesy of the publisher, we are able to reproduce two of them.

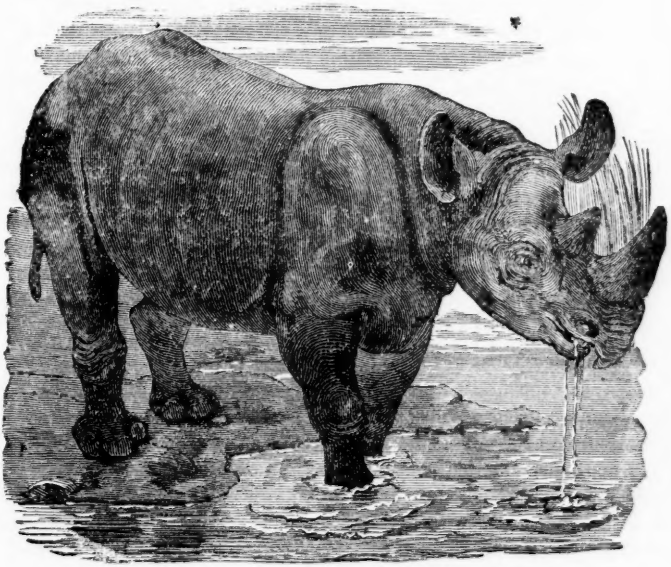

Fig. 2. *Atelodus bicornis;* the common African rhinoceros.

General Notes.

GEOGRAPHY AND TRAVELS.

The Ascent of Mount St. Helens.—The following abstract of an account of the ascent of Mount St. Helens by Mr Fred. G. Plummer, prefaced by a brief history of its recent eruptions, appeared in the December number of *Scientific American:*

"St. Helens has shown considerable activity in recent times. In August, 1831, there was an uncommonly dark day, which was thought to have been caused by an eruption of a volcano. The whole day was nearly as dark as night, except for a slight red, lurid appearance, which was perceptable until near night. Lighted candles were necessary during the day. The atmosphere was filled with very light ashes, like the white ashes of wood. The day was perfectly calm. There were no earthquakes or rumblings. After the ash clouds had cleared away it was seen that the pure white snow upon St. Helens was browned by the fall of ashes. It is also said that lava flows took place at that time."

"In October, 1842, St. Helens was discovered all at once to be covered with a dense cloud of smoke, which continued to enlarge and move off in dense masses to the east, filling the heavens in that direction. When the first volume of smoke had cleared away it could be seen distinctly from various parts of the country that an eruption had taken place on the north side of St. Helens, a little below the summit, and from the smoke that continued to rise from the crater it was pronounced a volcano in active operation. When the explosion took place the wind was morthwest, and on the same day, extending from thirty to fifty miles to the southwest, there fell showers of dust or ashes, which covered the ground in some places so as to admit of its being gathered in quantities."

"On November 23, 1843, St. Helens scattered ashes over the Dalles of the Columbia River, fifty miles away, and burned continuously until February 16, 1844. Dense masses of smoke rose from the craters in immense columns, and in the evenings the fires 'lit up the mountain side with a flood of soft yet brilliant radiance.'"

"Having determined to investigate the most active volcano of Washington, we left Tacoma by the midnight train, August 10, 1893,

with packs containing necessaries for the trip and the instruments for observing and recording all we were to see."

"When we reached the mountain, with the aid of a glass I was able to map out a route to the larger of the craters which would not cross any of the great crevasses in the ice slopes. Our ascent began immediately, and in less than an hour became very steep and in places dangerous. Our progress was checked by an enormous cañon, several hundred feet deep, which appeared a counterpart of the great cañon of the Yellowstone. Its formation showed several old lava flows, which, being firmer than the cinders and broken rock, in most places overhung the walls of the cañon and made descent out of the question. The great glacier at its head was fully 100 feet deep at the foot, and was ploughing its way into a huge terminal moraine of small rocks. We could plainly hear the rocks grinding together as the great body of ice slowly forced them down the cañon. This great glacier headed in the ice cap at the summit of the mountain, and, although it looked steep and slippery, we decided to try the route. It was then 10 o'clock in the morning—a bad time to climb ice slopes aud snow fields—but we had been gone from Tacoma nearly a week and had only provisions for two more days. We had proceeded but a short distance cutting steps in the steep ice slope, when a bombardment of rocks warned us that our route was to be a dangerous one. The surface of the glacier seemed a sheet of ice clear to the summit, and down its slippery surface came rocks large and small as fast as the noonday sun melted the ice and snow which held them near the top."

"Imagine a toboggan slide about three miles long, starting nearly 10,000 feet above the sea with an initial grade of forty-five degrees. The speed of the rocks as they passed us was terrific. They whirled at such a rate that they seemed spherical in form, and as they flew down the slope seemed only to touch the high places in the slightly wavy surface of the glacier, making a metallic sound as they clipped the ice into a cloud which trailed them like a comet's tail. Here and there great rocks lay upon the surface of the glacier, probably having been held by a fall of new snow, and now and then one of these flying rocks would strike those which were held by the ice, and, amid a shower of sparks and chips, would bound into the air fifty feet or more, still whirling like a buzz saw and giving out a sound which I cannot describe. All this would have been very entertaining if so many of the flying rocks had not passed near us."

"We were exposed to this danger for over an hour while climbing a quarter of a mile, and to say that we were all thoroughly frightened

would not do the rocks justice. When at last we reached a place of comparative safety, we were too much much awed to speak."

Source of the Mackenzie River.—Up to the present time the Mackenzie River has never been traced to its head, and its source has only been known from Indian report. The mystery has been solved by Mr. R. G. McConnell of the Dominion Geological Survey, who has just returned from a four months' exploration trip in those regions. The following account of his trip is taken from the *Vancouver News-Advertiser:*

"Mr. McConnel arrived in British Columbia from Ottawa in June, and started out on his trip fron Quesnelle on the 9th of that month. The party numbered six in all and consisted of himself, his assistant, Mr. Russel, two whites he engaged at Quesnelle and two Indians. From Quesnelle the party proceeded in canoes up the Frazer to Giscome Portage. This is seven and a half miles long, and after crossing it they proceeded down Crooked River to Fort McLeod. Their route then lay down Parsnip River to the forks, where Findlay River meets the Parsnip and gives birth to Peace River."

"On reaching Findlay River Mr. McConnel really commenced his summer's work, as the chief object of his trip was to explore that river and, if possible, the Onimeca also. Mr. McConnel accordingly went up Findlay River to its junction with the Onimeca, and followed the latter river to its head, returning down it again to the same spot. This river is easy navigable on the upper portion, but in the first thirty miles it falls over 500 feet, and is consequently extremely rapid and difficult to ascend. Mr. McConnel then proceeded up the Findlay River."

"Whites had been up the Onimeca River previous to him, as at one time that was a famous gold country, but Mr. McConnel and his party were the first whites to ever ascend the Findlay River to its head. The river is about 250 miles long and is navigable for the greater portion of the way in canoes, though owing to the rapids the party had to proceed the last fifty miles on foot, an arduous proceeding, owing to the roughness of the country. The country is very mountainous, and though at the lower part of the river the valley is six miles wide, the mountains come right down to the water's edge in the upper portion."

"At its mouth the Findlay is about as wide as the Frazer at Quesnelle. It is not deep except in the cañons, where the current is very strong, and, owing to numerous rapids and eddies, progress is very slow. At the head of Findlay River is a lake known in the Indian

tongue as Lake Fehutade, which, being interpreted, means "narrow waters between mountains." This lake is the real source of the Mackenzie River. It is between twenty-five and thirty miles long and not more than a quarter of a mile wide, and is enclosed by high mountains. Around the edge of the lake are glaciers, and the scene is a very pretty one. The mountains rise 5000 to 6000 feet above the lake, while they are some 9000 feet above the level of the sea. After exploring the lake Mr. McConnel started on his homeward journey about the end of August, and it was none to soon, as ice began to form on the river, and while on the Parsnip the party experienced a snowstorm."

GEOLOGY AND PALEONTOLOGY.

A Food Habit of the Plesiosaurs.—Mr. S. W Williston reports finding a number of pebbles in such a position with respect to the bones of a Plesiosaur discovered in the Niobrara chalk in Kansas that the conclusion is irresistible that the stones had been in the stomach of the reptile. They had probably been swallowed to aid in digestion, a custom still in vogue among the Crocodiles. Some of the pebbles were attached by the original soft limestone matrix to the ribs and thoracic vertebræ, so that there could not be a shadow of a doubt as to the contemporaneity of deposition.

The saurian is one of the largest of the order, measuring when alive about fifty feet. The pebbles, 125 in number, are extremely hard, consisting almost wholly of silica, varying in weight from 1 to 170 grams. They are conspicuous in color, either white, black or pink, and show a great amount of abrasion, and probably came from the shores of the Benton sea.

From the uniformity of shape among the smaller ones, their number, and their color, Mr. Williston is inclined to think they were not merely water-worn pebbles, accidentally swallowed, but they had been selected by the saurian for a purpose, and that their present shape is owing to their prolonged use as "gizzard stones" in the animal's stomach. (Trans. Kansas Acad. Sci., Vol. XIII, 1891-92.)

The Texas Region.—In a recent paper on the physical geography of Texas, R. S. Tarr embodies the results of his personal observation with the published geological work of others in the same region and summarizes the geological history of Texas as follows:

"The evolution of the Texas region began with an old Paleozoic or Pre-Paleozoic mountainous land which was denuded at the beginning of Carboniferous times to an old topographic form, not unlike the hilly region of southern New England. The Carboniferous beds were added to this land, by elevation, first as a costal strip, even before the end of the Carboniferous. A gathering in of shore lines formed a great interior sea, later a completely land-locked dead sea in which Permian beds were deposited; and from the close of the Permian to the beginning of the Cretaceous there was a period of denudation during which the younger Paleozoic beds were reduced to base-level and the older mountainous areas still farther degraded. A rapid subsidence lowered

the entire region below the Cretaceous sea; then at the close of the Cretaceous the land was elevated, possibly by the renewal of the mountain-building forces of the central area. The Rocky Mountain uplift caused an uptilting, raising the land still higher, and adding the Tertiary coastal strip to the Cretaceous. A later uplift added the costal prairies and a recent slight subsidence has completed this record of change, and has given us the Texas region." (Proceeds. Phila. Acad., 1893.)

Terrestrial Submergence Southeast of the American Continent.—At the meeting of the American Association for the Advancement of Science, Madison, 1893, Dr. J. W. Spencer brought before the Society evidence of epeirogenic movements in the Antillean region, in very recent geologic times, amounting to two and one half miles of vertical subsidence of great land areas. The author's recent studies of valleys among the southern Appalachian mountains convinces him that these valleys are independent of mountain movements, and are due to erosion, either atmospheric or by running water. The valleys and channels among the Greater Antilles, and between them and the continent, are an exact reproduction of the southern Appalachian land valleys. From this analogy the author concludes that both the land and submerged Antillean valleys were of a common subaerial origin.

The submerged valleys and channels are of varying depths, the author cites examples ranging from 3,738 feet to 14,000 feet, and even in one case 20,000 feet is reached. The submergence indicated by the channels means extensive continental land-movements, which were not violent enough to obliterate the former land topography. This great continental depression diminished to the north, so that the southern states have been only partly submerged.

The great continental extension was during late Cenozoic time, if McGee's determination of the age of the Lafayette formation be accepted. The drainage of this area was largely into the Pacific, or its embayments. The watershed between the Atlantic and Pacific is still represented by the mountains of Cuba, Haiti and the Windward islands. (Bull. Geol. Soc. Am., Vol. 5, Nov., 1893.)

Tropical Miocene Fossils in Siberia.—A small collection of fossils collected by Dr. William Stimpson in northern Siberia, about 62° north latitude, on an arm of the Okhotsk sea, has been reported upon by Dr. Wm. H. Dall. The collection comprises six species of molluscs, of which five are new. In his general conclusions the author

remarks that "formally the species point to a distinct analogy with those of the China and Japan seas, and like the existing fauna of those seas, they indicate bonds of relationship with the west coast of Africa and the coast of Australia."

The matrix of the fossils determines them to be of Miocene age, and as the fauna indicated by them lived in waters as warm as the Japan sea, the annual mean temperature of the Okhotsh sea in the era in which these fossils flourished must have been about 60° F., a difference of 30° to 40° F. from that of the present time. (Proceeds. U. S. Natl. Mus., Vol. XVI., 1893.)

Arctic Geology.—According to Sir Henry Howorth the Arctic lands, during the Pleistocene period, instead of being overwhelmed by a glacial climate, were under comparatively mild conditions. Since Plistocene times the climate has been growing more and more severe. The author bases this conclusion on a study of the Arctic flora as displayed in Greenland, Spitzbergen, and the uncovered moraine of the great glacier in Alaska, and also upon certain faunal facts. He cites evidence to show that the present flora of Greenland is undoubtedly a relic of an old flora which has survived in favorable localities, and not an importation since Glacial times. The same is true of the Spitzbergen flora. The discovery of a colony of sea-cows on Behring's Island seems to indicate a recently milder climate in that region. The peculiar types of northern migratory birds suggests that at no very remote period they lived the year round in their present breeding places in Northern Siberia, Greenland and Spitzbergen, and that it is the present ever increasing cold that leads them to migrate in search of warmth and food. In short, the only Glacial climate we are warranted in supposing to exist in the Arctic lands is that which is now current, and it is the product of changes in the level of the earth's crust since Plistocene times. (Geol. Mag., Nov., 1893.)

An Extinct Lemuroid from Madagascar.—At a recent meeting of the Royal Society of London Dr. Henry Woodward read a communication from Mr. Forsyth Major concerning a huge fossil Lemuroid from Madagascar, to which we referred in the Nov. number of the NATURALIST (p. 1002). The following report is given in *Nature*, July 20, 1893.

"It is now forty-two years since Geoffroy Ste-Hilaire announced to the French Academy of Science the discovery of gigantic eggs and a few bones of Æpyornis from superficial deposits in the Island of

Madagascar, anticipating that a rich fauna of extinct vertebrata would be speedily forthcoming. Little has, however, been added to our knowledge since 1851 to the present time. In addition to the remains of a Crocodile, two Chelonians, and a Hippopotamus, first discovered by Grandidier, the number of distinct forms of Æpyornis is now rapidly increasing, and promises to rival in variety the New Zealand species of Dinornis, whilst the disclosure of a rich mammalian fauna seems only waiting to reward the carrying out of systematic exploration.

"Four collections of sub-fossil vertebrates, from various regions of Madagascar, have recently been acquired by the British Museum of Natural History. Amongst one of these sent over by Mr. J. T. Last is a somewhat imperfect skull of strange appearance obtained with numerous fragmentary Chelonian, Crocodilian, Hippopotamus and Æpyornis, remains from a marsh at Ambolisatra on the southwest coast of Madagascar. For this remarkable fossil Dr. Major proposes the name *Megaladapis madagascariensis*, and the establishment of a distinct family of the sub-order Lemuroidea, of which Megaladapis appears to be a much specialized gigantic member, being approximately three times the size of the cranium of the largest existing Lemurid.

"The salient features of the skull are the enormous lateral development of the anterior inter-orbital portion of the frontals, extending over the small, thick-walled tubular orbits. The post-orbital frontal region is comparatively narrow and elongate, and separated by a slight contraction from the equally narrow parietal region, bearing a thick and flattened sagittal crest. The brain-case is low, short and narrow, and placed at a considerable higher level than the elongate facial portion. Both the cranial and facial portion are somewhat bent upwards, the former posteriorly, the latter anteriorly. A striking general character is the remarkable pachyostosis (thickening) of the cranium.

"The author points out that, in its peculiar features, this skull only carries to an extreme, characters which are present, but in a much lesser degree, and in varying gradations, in the different members of the Lemuroidea, both recent Lemuridae, and extinct Adapidae. In the very simple pattern of the molars, the superior of which are of the pure tritubercular type, Megaladapis approaches closely to the Malagasy Lemurides, Lepidolemur, and still more to Chirogaleus.

"The diminutive size of the brain-case (comparable only with what we find amongst the Marsupialia and the Insectivora) is viewed by the author, in this instance, as a degeneracy, other characters being equally indicative of a retrogressive evolution undergone by this Lemuroid.

"It is strongly insisted upon, generally, that 'low' organization in Mammalia is by no means always synonymous with 'primitive' organization, and that retrogressive evolution is more frequently to be to be met with amongst Mammalia than is generally admitted.

"As regards the geological age of Megaladapis and its associated fauna, one of whose members the *Crocodilus robustus*, is still living in the lakes of the interior, evidences of various kinds goes far to prove that these sub-fossil remains represent a fauna which was living at a comparatively very recent period, and that man himself was contemporary with it, and in part responsible for its destruction.

"The author adduced evidence in support of the proposition that an older Tertiary vertebrate fauna will ere long be forthcoming in Madagascar."

Geological News. General.—In a brief report on the organic remains obtained from a deep well near Galveston, Texas, Mr. G. D. Harris compares the fossil shells with the recent ones of the Atlantic and Pacific shores of America and the fossil faunæ of the Atlantic slope, including that of the West Indies. The relationships are shown in a bathymetric table. The collection comprises 77 species, of which 20 are new. In addition to the marine forms enumerated in the table, the following fresh water species were obtained: *Polygyra hindsii* Pfr., *Amnicola*, not distinguishable from *peracuta*, and a *Planorbis* allied to *P. vermicularis* from the Lake of the Woods. (Fourth Ann. Rept., 1892, Geol. Surv., Texas.)

Paleozoic.—A new gasteropod, *Loxonema winnipegense* from the Trenton limestone of Manitoba is described and figured by Mr. J. F. Whiteaves. The author considers it of interest on account of its strikingly close similarity to some of the most typical Jurassic species of Pseudomelaniæ. (Canadian Rec. Sci., 1893.)

In regard to the use of the term "Catskill," Mr. J. J. Stevenson avers that, in nine-tenths of the area in which this series is exposed within the Appalachian Basin, the Chemung is the important portion of the series. Catskill is simply epochal but "Chemung" carries with it the conception of those physical and biological characteristics which mark the closing period of the Devonian. For which reasons, Chemung should be used to designate the whole group, retaining Catskill in its original and local signification only. (Amer. Journ. Sci., Nov., 1893.)

Mesozoic.—In a contribution to the "Invertebrate Paleontology of the Texas Cretaceous," Mr. F. W. Cragin describes 168 species dis-

tributed as follows: Cœlenterata, 1 sp. nov.; Echinodermata, 32, of which 17 are new; Molluscoidea, 2 sp. nov.; Brachiopoda, 1 sp. nov.; Mollusca, 132, of which 82 are new. The text is illustrated by 46 plates of drawings, some of which were made by the writer. (Fourth Annual Rept., 1892, Geol. Surv., Texas.)

The discovery of fossil Cretaceous plants at Glen Cove, and various other localities in Long Island, by Mr. Arthur Hollick, together with the collections made by Mr. David White in Gardiners Island, Block Island, Center Island and Marthas Vineyard, have enabled Mr. Hollick to trace the continuity of the cretaceous strata from New Jersey through Staten and Long Islands to Marthas Vineyard, and to demonstrate beyond question that the theory of Mather and subsequent observers in regard to the eastward extension of the cretaceous formation was correct, and emphasizes the probability that certain limited areas of the New England coast could also be referred to that horizon. (Trans. New York Acad. Sci., Vol. XII, 1893.)

Two new forms of the Pycnodont genus Anomœdus, *A. superbus* and *A. willetti* from the upper English Cretaceous are described by A. Smith Woodward. This genus was described by Forir, but his definition was based solely upon the arrangement of the splenial teeth. The new material enables Woodward to make the definition more satisfactory. In the same paper the author describes the splenial dentition of two new species of Cœlodus, *C. inaequidens* and *C. fimbriatus*. (Geol. Mag., Nov., 1893.)

In some notes on a few fossil leaves from the Fort Union group of Montana, Mr. F. H. Knowlton describes a new species, *Populus meedsii*, evidently related to *P. heerii* Sap. from the Eocene at Florissant, Colorado, and which has for a living analogue *P. angustifolia* James, a species living along streams from New Mexico and Colorado to California and Washington. (Proceeds. U. S. Natl. Mus., Vol. XVI, 1893.)

Cenozoic.—In a study of the rocks of Carmelo Bay, California, Mr. A. C. Lawson finds no evidence for Whitney's statement that Miocene rocks are here invaded by a mass of granite. The rocks, consisting of sandstone and shales, are probably Eocene, and rest upon a worn and eroded surface of granite. The supposed metamorphic rocks are laminated volcanic flows. Miocene formations are abundantly developed but do not extend down to to the shores of the bay. (Bull. Univ. California, Vol. I, 1893.)

Mr. R. A. F. Penrose records the discovery of a Plistocene manganese deposit near Golconda, Nevada. The ore occurs as a lenticular mass in a soft calcareous tufa, and probably represents a local precipitation from spring waters. The position and nature of the ore show that the bed was laid down in shallow water and subsequently covered over by a tufa deposited from the supersaturated lake water. (Journ. Geol., Vol. I, 1893.)

MINERALOGY AND PETROGRAPHY.[1]

The Granite of Santa Lucia, California, and a New Rock Variety Carmeloite.—The Santa Lucia Mountains[2] in the vicinity of Carmelo Bay, California, consist largely of a porphyritic granite whose phenocrysts of glassy orthoclase are corroded with inclusions of cloudy orthoclase, plagioclase, quartz, biotite, apatite and muscovite, which substances also constitute the groundmass of the rock. The striking feature of the inclusions is that their different areas are not only uniformly orientated with respect to each other, but they are also definitely orientated with reference to their host. They lie in certain definite planes within the phenocrysts, and their crystallographic axes are definitely arranged with respect to the axes of their hosts. The quartzes all lie with their vertical axes nearly perpendicular to the basal plane of the orthoclase, consequently in sections of the phenocrysts cut parallel to the basal pinacoid every included quartz grain exhibits the axial figure. Another feature worthy of notice is the tendency of the inclusions to idiomorphic forms, whereas, the same minerals in the rock's groundmass are always allotriomorphic. The facts of the idiomorphism of the inclusions and their definite orientation suggest to Lawson that these and their hosts are of contemporaneous age. This view is strengthened by the observation that many inclusions on the edges of the phenocysts have grown out into the surrounding matrix, in which, as has already been noted, the components are the same as those occurring as inclusions, but are much larger than these, and are allotriomorphically developed. This granite is cut by dykes of fine-grained aplite.

The rock to which the author has given the name Carmeloite, is a young volcanic, marked by all the characters of a recent lava. It is probably younger than the Monterey series of the Miocene, and older than the newer terrace formations of the region. Under the microscope the rock is seen to consist of phenocrysts of iddingsite, plagioclase and often augite in a matrix composed of a felt of small, lath-shaped plagioclase and granules of magnetite and pyroxene, lying in a glass containing numerons feebly polarizing globulites. There are six areas of the rock in the Carmelo Bay district, the occurrences differing mainly in the quantity of glass present, the presence or absence of

[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Me.

[2] A. C. Lawson, Bull. Dept. Geol. Univ. of Cal., Vol. I, p. 1.

iddingsite in the groundmass, and of augite among the phenocrysts. The occurrences differ also in their chemical composition, their silica contents varying between 52.83 % and 60.00 %. The analysis of one specimen (Sp. Gr. = 2.51--2.54).

SiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	CaO	MgO	K_2O	Na_2O	Ign.	Total
60.00	19.01	3.20	.68	tr.	4.10	1.28	2.79	6.97	4.30	= 102.33

Since the rock contains too much SiO_2 for a basalt, and too little for andesite, and because of the prominence of iddingsite as one of its essential components, the author prefers the new name, Carmeloite, to any already in use among petrographers.

The Ancient Rocks of Southern Finland.—In the German resumé of his article on the old rocks of southern Finland, Sederholm[3] divides these into two groups—the Archean and the Algonkian, and the first of these groups into two sub-groups. The older Archean consists of phyllites, gneisses, micaceous and other schists and granular limestone, cut by granite and diorite. All the members of the series have been subjected to dynamic metamorphism on an enormous scale. The schists are supposed to have originated both in sedimentary and in erruptive rocks. The younger Archean schists are phyllites, mica-schists, sandstone-schists, and a greenstone schist that was originally a uralite porphyrite occurring as a surface flow. These are cut by a red granite that is sometimes porphyritic and often pegmatitic. It shows no evidence of having been subject to great pressure, but nevertheless it is foliated—a consequence, according to the author, of flowage. The Algonkian rocks are all fragmental, and above them are the Rapakivi granite and a diabase, both of which are effusive. A younger olivine diabase and a panidiomorphic gabbro are also thought to be volcanic flows.

Petrographical News.—Smith[4] has discovered that the supposed peridotite[5] of Manheim, N. Y., is an alnoite in which there is no pyroxene. It contains a large quantity of melilite in the typical forms, but the mineral is positive in the character of its double refraction, like the artificial melilite made by Vogt. Incidentally the author mentions that positive melilite exists also in the nepheline basalt of Wartenburg, Bohemia, and in the alnoite from Alno, Sweden.

[3] Fennia, 8, No. 3, p. 138.
[4] Amer. Journ. Sci., XLVI, p. 105.
[5] Cp. AMERICAN NATURALIST, Sept., 1892, p. 769.

About 600 miles north of the Falkland Islands in the South Atlantic, a fall of volcanic dust occurred on May 26, 1892. Palache,[6] who has examined some of the material, finds it to consist of fragments of glass and pieces and crystals of orthoclase, plagioclase, green hornblende and magnetite, with a very small quantity of what appears to be pyroxene. The character of the dust is thus andesitic.

New Minerals.—*Iddingsite* has been known for some time as a component of certain eruptive rocks from the far west, but not until Lawson[7] discovered it in the carmeloite of California, had its characteristics been carefully enough investigated to warrant its receiving a name. As described by Lawson, iddingsite occurs as a phenocryst with well-defined crystal outlines. It is of a bronzy color, has a very perfect cleavage and a hardness of 2.5. Its cleavage lamellae are brittle. Before the blow-pipe the mineral is infusible, though it loses water when heated. It is decomposed by acids after long treatment, but loses only its dark pigment, without alteration of its optical properties, when gently heated with hydrochloric acid. Maximum density = 2.839. Its crystals possess in thin section the habit of olivine. If the cleavage is regarded as pinacoidal, the other crystallographic faces are the prism, with a prismatic angle of about 80°, and another pinacoid, both of which are perpendicular to the cleavage. The elongation of the crystals is in the direction of the second pinacoid. If the cleavage is regarded as parallel to the macropinacoid, b is in the cleavage plane, a is at right angles to it, and c is parallel to the elongation of the crystals. The plane of the optical axes is the brachypinacoid, and the mineral is orthorhombic and negative; $a = A$, $b = B$ and $c = C$. In thin section the color varies between yellowish green and chestnut brown, and tbe absorption is strong parallel to c. The absorption formula is $C > B > A$. The mean index of its fraction is low, and the double refraction strong. Qualitative tests showed the presence of silicon, iron, calcium, magnesium, sodium and water. In spite of the resemblance of its crystals to those of olivine, the author regards it as most probably an original separation from the magma that yielded the carmeloite.

Mackintoshite is the name given by Hidden and Hillebrand[8] to the original material from which the alteration product *thorogummite*[9] is derived. Only a very small quantity was available for study. This is

[6] Amer. Geol., June, 1893, XI, p. 422.
[7] Bull. Dept. Geol. Univ. of Cal., Vol. 1, p. 31.
[8] Amer. Jour. Sci.. XLIV, 1890, p. 98.
[9] AMERICAN NATURALIST, Jan., 1893, p. 72.

described as opaque and black. Its hardness is 5.5 and density 5.438. Its crystals are square tetragonal prisms and pyramids like those of zircon. It is infusible before the blow-pipe, and is insoluble in the simple acids. It dissolves readily in a mixture of nitric and sulphuric acid, and in aqua regia. In nine-tenths of a grain of material, the following constituents were found:

SiO_2	UO_2	ZrO_2(?)	ThO_2	La_2O_3.	Y_2O_3	PbO	FeO	CaO	MgO	K_2O	$(NaLi)_2O$	P_2O_5	H_2O
13.90	22.40	.88	45.30		1.86	3.74	1.15	.59	.10	.42	.68	.67	4.81

The new mineral thus differs from thorogummite in the possession of one molecule of thoria.

Canfieldite is a new germanium mineral from somewhere in Bolivia.[10] Its crystallization is regular, small crystals being bounded by the octahedron and the dodecahedron. The hardness is 2.5, density 6.266, lustre metallic and color black with a purplish tinge. Its streak is grayish black and degree of fusibility 1.5 to 2. Upon analysis, the following result was obtained:

S	Ge	Ag	Fe. Zn.	Ins.		Total
17.04	6.55	76.05	.13	29	=	100.06

which corresponds to the formula Ag_8 Ge S_6. A re-analysis of the Freiberg argyrodite yields results that accord better with the formula above-given than with the formula Ag_6 Ge S_5 proposed for it by its discover, Winkler.[11] Both minerals have the same composition, consequently, since argyrodite is monoclinic, they are dimorphs.

Marshite.—This copper iodide[12] occurs at Broken Hill, New South Wales, as tiny crystals implanted on a siliceous cerussite. The crystals are probably hemihedral-tetragonal. In color they are reddish-brown, in lustre, resinous. They possess an orange yellow streak, are transparent and brittle.

Kehoeite, from Galena, Lawrence Co., S. D., forms seams and bunches in the galena of the Merritt mine. The material is white, amorphous and insoluble in water. Its analysis yielded Headden[13] the following figures:

P_2O_5	SO_3	ZnO	CaO	Al_2O_3	Fe_2O_3	MgO	Cl	H_2O	Ins.	Total
26.76	.50	11.64	2.70	24.84	.78	.08	tr.	31.06	1.76	= 100.02

[10] S. L. Penfield, Amer. Jour. Sci., XLVI, 1893, p. 101.
[11] Jour. f. prakt. Chem., XXXIV, 1886, p. 177.
[12] C. W. Marsh, Proc. Roy. Sci. N. S. W., XXVI, p. 326.
[13] Amer. Jour. Sci., XLVI, p. 22.

corresponding to $R_3(PO_4)_2+2\ Al_2(PO_4)_2+2\ Al_2(OH)_6+21\ H_2O$.

Neptuneite and *Epididymite* are associated[14] with aegirite, arfvedsonite, eudialyte, etc., near Julianehaab, Kangerdluarsuk, Greenland. The former is found as short, prismatic monoclinic crystals, with a perfect cleavage parallel to ∞P. Their color is black in the larger crystals, but deep red brown in the small ones. Their hardness is 5–6, density, 3.234, and composition:

SiO_2	TiO_2	FeO	MnO	MgO	K_2O	Na_2O	Total
51.53	18.13	10.91	4.97	.49	4.88	9.26	= 100.69

These figures correspond to the formula $(\frac{3}{4}\ Na_2+K_2)\ Si_4O_9+(\frac{2}{3}Fe+\frac{1}{3}\ Mn)\ TiO_3$. Epididymite is regarded as a dimorph of eudidymite. It occurs in orthorhombic prisms elongated in the direction of their macroaxes. Their analysis: $SiO_2 = 73.74$; $BeO = 10.56$ $Na_2O = 12.88$; $H_2O = 3.73$, corresponds to the formula for eudidymite, viz.: $HNa\ Be\ Si_3O_8$. Density = 2.548.

Franckeite, from near Chocaya, in the Animas District, Bolivia, is an associate of the silver ores of the region. It occurs,[15] as a radial, aggregate, or as a structurelass layer of a dark gray or black substance, that is opaque and soft. Its hardness is about 2.75, and density 5.55. Its quantitative analysis yielded:

Pb	Sn	Sb	S	Fe	Zn	Gangue	Total
50.57	12.34	10.51	21.04	2.48	1.22	.71	= 98.87

while qualitative tests showed it to contain also about .1% of germaniun and a fractional percentage of silver. The mineral is a sulfo-salt of the the formala: $Pb_2\ Sn_2\ S_6 + Pb_2\ Sb_2\ S_6$. It resembles in appearance and in the nature of its components the plumbo-stannite from Moho in Peru, but differs from it in the proportion of its constituents.

Cylindrite owes its name to the cylindrical form that it so commonly assumes. It is described by Frenzel[16] as possessing a dark, lead-gray color and a metallic lustre. It is malleable, has a hardness of 2.5–3, and a density of 5.42. It occurs in cylindrical bodies imbedded irregularly in a granular lamellae mass of the same substance. An analysis of the mineral gave:

Pb	Ag	Fe	Sb	Sn	S	Total
35.41	.62	3.00	8.73	26.37	24.50	= 98.63

[14] G. Flink, Geol. För. Förh., XV, 1893, p. 195.

[15] A. W. Stelzner, Neues Jahrb. f. Min., etc., 1893, II, p. 114.

[16] Ib., 1893, II, p. 125.

corresponding to $Pb_6\ Sb_2\ Sn_6\ S_2$. The mineral is easily decomposed by hot hydrochloric and nitric acid, but is scarcely affected by cold hpdrochloric acid. Like franckeite and plumbostannite, it is a South American mineral, occurring, as it does, at the Mina Santa Cruz, Poopó, Bolivia.

Hantefeuillite accompanies crystals of apatite, pyrite, iron and monazite at the apatite mine at Odegärden, Bamle, Norway. It is found in the greenish nodules composed of wagnerite and apatite, that are scattered through the apatite veins cutting gabbro. Michel[17] describes it as forming transparent, colorless monoclinic crystals radically grouped. Its hardness is 2.5 nnd density 2.435. The crystals are all tabular in habit, being elongated parallel to *c*, and flattened to $\infty P\ \breve{\infty}$. Their optical axes lie in the latter plane, and their optical angle has a value—2Vna = 54° 23′. An analysis gave $P_2O_5 = 34.52$; MgO = 25.12; Cao = 5.71; $H_2O = 34.27$, corresponding to $(Mg\ Ca)_3\ (PO_4)_2 + 8H_2O$, which is the guano mineral bobierrite in which Mg has been in part, replaced by Ca.

Chondrostibian, as its name indicates, is an antimony mineral occurring in grains. It is reported by Igelström[18] from the famous manganese mine Sjogrufran, Grythyttan, Sweden. It is found disseminated as grains through barite, which, with calcite and tephroite, forms a cryptio-crystalline mass. These grains constitute nearly 50% of some of the barite plates to which they impart a brownish tinge. The mineral itself is yellowish-red in color, though in large pieces it appears dark brownish red. It is weakly magnetic, and yields, upon analysis, figures indicating the following composition:

Sb_2O_5	As_2O_5	Mn_2O_3	Fe_2O_3	H_2O		Total
30.66	2.10	33.13	15.10	19.01	=	100.00

corresponding to $3R_2O_3\ Sb_2O_5 + 10\ H_2O$.

[17] Bull. d. l. Soc. Franç d. Min., xvi, p. 38.

[18] Zeits. f. Kryst., xxii, p. 43.

BOTANY.[1]

Ellis and Everhart's North American Fungi.—Subscribers to this set have recently received Century XXX of this great distribution of specimens, bringing the number up to 3000. Messrs. Ellis and Everhart are to be congratulated upon having carried their work to this point without a break or serious delay; an achievement never before excelled. May we not hope that they will push forward now toward the fortieth century?

The present volume is a miscellaneous one, including representatives of genera in widely separated families. Thus, there are of *Æcidium* 4 species, *Capnodium* 3, *Cercospora* 11, *Cladosporium* 2, *Cylindrosporium* 3, *Gymnosporangium* 2, *Morchella* 1, *Peronospora* 1, *Peziza* 4, *Phyllosticta* 4, *Puccinia* 7, *Septoria* 6, *Uromyces* 2, besides many others of equally wide relationship.

Of the quality of the specimens nothing need be said. The preceding Centuries have shown that in this regard nothing is wanting. Botanists who are so unfortunate as not to have secured a set of the North American Fungi, will be glad to know that the authors have begun a new set under the name of "Fungi Columbiani," of which they now offer Centuries I and II at six dollars each.—CHARLES E. BESSEY.

A Synopsis of the larger Groups of the Vegetable Kingdom.—The following synopsis represents the results of a careful review of the larger groups of the vegetable kingdom. The Classes are, with few exceptions, those usually recognized by modern authors, but in the first and second their limits have been slightly extended so as to include a comparatively small number of degraded chlorophyll-less forms, the Bacteria and the Phycomycetous fungi.

In like manner, in a few cases, slight changes have been made in the limits of the groups below classes (here tentatively called orders), otherwise they remain essentially as usually outlined. In the attempt to co-ordinate groups it becomes obvious that the "Orders" of the lower plants are equivalent to the "series" of the Angiosperms, according to the nomenclature of Bentham and Hooker's *Genera Plantarum*. At first sight it may seem to be a violent innovation to transfer the term "Order" from *Rosaceæ*, for example, to the great aggregate of forms, the *Calyciflorœ*, yet a careful study

[1] Edited by Prof. C. E. Bessey, University of Nebraska, Lincoln, Nebraska.

of the whole system of plants warrants the assertion that these Benthamian "series" are entitled to no higher rank. The so-called "orders" of the manuals are, in fact, no more than families, and these in the flowering plants have become greatly multiplied.

The apetalous families of Dicoyledons are not regarded as constituting a separate group, but are distributed among the Choripetalæ and Gamopetalæ. In both Monocotyledons and Dicolyledons the apocarpous families are regarded as primitive and lower, and the syncarpous as higher: and among the latter the epigynous are regarded as higher than the hypogynous.

SYNOPSIS.

Branch I. PROTOPHYTA (Protophytes; Water-Slimes).

Single cells, or chains of cells, reproducing by fission and endospores.

Class 1. SCHIZOPHYCEAE. (Fission Algæ.) { Order Cystiphoraе (Blue-green Slimes). Order Nematogeneae (Nostocs, Bacteria, etc.).

Branch II. PHYCOPHYTA (Phycophytes; Spore-Tangles).

Single cells, chains, or masses, the latter sometimes forming a branching plant with rhizoids. Sexual reproduction by the union of two protoplasts to form a single resting-spore (zygospore or oöspore).

Class 2. CHLOROPHYCEAE. (Green Algæ.) { Order Protoccoideae (Green-Slimes, Synchytria, etc.). Order Conjugatae (Pond-Scums, Black Moulds, etc.). Order Siphoniae (Green-Felts, Downy Mildews, etc.). Order Confervoideae (Water-Flannels; etc.).

Class 3. PHAEOPHYCEAE. (Brown Algæ.) { Order Phaeosporeae (Kelps). Order Dictyoteae. Order Fucoideae (Rockweeds).

Branch III. CARPOPHYTA (Carpophytes; Fruit-Tangles).

Chains, plates or masses of cells, the latter often forming a branching plant with rhizoids. Sexual reproduction (where known) by the union of two protoplasts to form a spore-fruit (sporocarp).

Class 4. COLEOCHAETEAE. { Order Coleochaetaceae (Simple Fruit-Tangles).

Class 5. ASCOMYCETES. (Sac-Fungi.) { Order Perisporiaceae (Simple Sac-Fungi). Order Tuberoideae (Subterranean Sac-Fungi). Order Pyrenomyceteae (Black Fungi, including lichens). Order Discomyceteae (Cup Fungi, including lichens).

"Imperfect Fungi." { Order Uredineae (Rusts). Order Ustilagineae (Smuts). Order Sphaeropsideae. Order Melanconieae. Order Hyphomyceteae.

Class 6. BASIDIOMYCETES. (Higher Fungi) { Order Gasteromyceteae (Puff-balls, etc.). Order Hymenomyceteae (Toadstools, etc.).

Class 7. RHODOPHYCEAE. { Order Florideae (Red Seaweeds).

Class 8. CHAROPHYCEAE. { Order Characeae (Stoneworts).

Branch IV. BRYOPHYTA (Bryophytes; Mossworts).

Masses of cells, forming a flat, branching plant with rhizoids, or a leafy stem (oöphyte), reproducing by the union of two protoplasts and the formation of a leafless, spore-bearing stem (sporophyte).

- Class 9. HEPATICAE. (Liverworts.)
  - Order Marchantiaceae (Liverworts, proper).
  - Order Jungermanniaceae (Scale-mosses).
  - Order Anthocerotaceae (Horned Liverworts).
- Class 10. MUSCI. (Mosses.)
  - Order Andreaeaceae.
  - Order Sphagnaceæ (Peat Mosses).
  - Order Archidiaceae.
  - Order Bryaceae (True Mosses).

Branch V. PTERIDOPHYTA (Pteridophytes; Fernworts).

Masses of cells, forming a flat plant, usually with rhizoids (oöphyte), reproducing by the union of two protoplasts and the formation of a stem with roots and spore-bearing leaves (sporophyte).

- Class 11. FILICINAE. (Ferns.)
  - Order Ophioglossaceae (Adder-Tongues).
  - Order Marattiaceae (Ringless Ferns).
  - Order Filices (True Ferns).
  - Order Hydropterideae (Pepperworts).
- Class 12. EQUISETINEA.
  - Order Equisetaceae (Joint-rushes; Horsetails).
- Class 13. LYCOPODINAE. (Lycopods.)
  - Order Lycopodiaceae (Club-mosses).
  - Order Selaginelleae (Little Club-mosses).
  - Order Isoetaceae (Quillworts).

Branch VI. ANTHOPHYTA (Anthophytes; Flowering Plants).

Oöphyte small, few-celled, enclosed in the tissue of the sporophyte; reproducing by the union of two protoplasts and the formation of a sporophyte consisting of a stem with roots and spore-bearing leaves, the latter constituting the "flower."

- Class 14. GYMNOSPERMAE. (Gymnosperms.)
  - Order Cycadeae (Cycads).
  - Order Coniferae (Conifers).
  - Order Gnetaceae (Joint-Firs).
- Class 15. ANGIOSPERMAE. (Angiosperms.)
  - Sub-Cl. I. *Monocotyledones.* (Monocotyledons.)
    - Order Apocarpae (Water Plantains).
    - Order Coronarieae (Lilies).
    - Order Nudiflorae (Aroids).
    - Order Calycinae (Palms).
    - Order Glumaceae (Grasses and Sedges)
    - Order Hydrales (Waterworts).
    - Order Epigynae (Irids).
    - Order Microspermae (Orchids).
  - Sub-Cl. II. *Dictyledones.* (Dicotyledons.)
    - i. Choripetalae.
      - Order Thalamiflorae (Toral Choripetalae; Torals).
      - Order Disciflorae (Discal Choripetalae; Discals).
      - Order Calyciflorae (Calycal Choripetalae; Calycals).
    - ii. Gamopetalae.
      - Order Heteromerae (Heteromeral Gamopetalae; Heteromerals).
      - Order Bicarpellatae (Bicarpal Gamopetalae; Bicarpals).
      - Order Inferae (Inferal Gamopetalae; Inferals).

In the foregoing, the slime moulds (*Mycetozoa*) have been omitted, as there can be but little doubt that they more properly belong to the animal kingdom.—CHARLES E. BESSEY.

ZOOLOGY.

Pteropodus Dallii sp. nov. Type:—One specimen 200 mm. long, San Francisco. Head 3, depth 3. D, XIII, 14½; A, III, 6½.

Dorsal spines moderate, two in head; lower jaw projecting. Three straight, dark crossbands, one from nape across base of pectoral, one from between 6th and 7th dorsal spine toward anus, a half one from 8th to 10th dorsal spine to lateral line, a broader one below soft dorsal. These bars extending onto the dorsal fin. A few small dark spots on base of pectorals and on shoulder; sides of tail more or less mottled. Dark streaks radiating from eye. Maxillary extending beyond eye, about 2½ in head. Eye equals snout, 3⅔ in head, considerably more than inter-orbital width. Inter-orbital concave, two strong ridges dividing it into a median and two lateral grooves. Pre-orbital narrow, with two flat spine processes. Preopercular spines directed backward. Gill-rakers, about two in orbit. Second anal spine 2½ in head. Maxillary, mandibles and snout naked. Scales mostly cycloid. Peritoneum pale. Lower pectoral rays thick and fleshy.

The single specimen belongs to the collections of the Indiana University. We have taken the liberty to name this species for William Healy Dall of the Smithsonian Institution, who has been intimately identified with west coast zoology for many years.

C. H. Eigenmann & C. H. Beeson.

Changes of Plumage in the Bobolink.—Mr. F. W. Chapman shows in the *Auk*, Nov., 1893, a colored plate illustrating the change of plumage in *Dolichonyx oryzivorus*. According to the author the male bobolink in the course of one year passes through the following phases of plumage. Late in July, when the breeding season is over, the black male undergoes a complete molt and appears in the yellowish plumage of the reed-bird, which closely resembles the plumage of the breeding female. In this costume the birds migrate southward, pausing in the rice fields of our southern states, and apparently continuing their journey to the Campo districts of Brazil. A specimen taken at Corumba, Matto Grosso, Brazil, shows that in the spring, as well as after the breeding season, a complete molt takes place, and the male appears in a suit of black feathers tipped with yellow. As the birds travel southward the yellow tips slowly drop off, the nape, scapula and rump fade, and the bill and feet change respectively from flesh color

to blue black and brownish-black. This is shown in a finely graduated series of intermediates in the American Museum of New York. Birds taken during the summer represent the extreme of faded and abraded plumage.

On Three New Genera of Characinidæ.—The following genera were found by Mr. H. H. Smith in the upper waters of the Jacuhy River in the Brazilian State of Rio Grande do Sul.

ASIPHONICHTHYS. This is Anacyrtus with imperfect lateral line, a few anterior scales only displaying it. The only species is *A. stenopterus* sp. nov., which has the following characters. Scales large, l. l. 42; l. tr. 20. Radii; D 11; A 46; V 9; P 15. Depth 2.66 in length less caudal fin; head in do 3.8. times. Eye 3, equal interorbital space. An obscure postclavicular spot; no basal caudal spot.

CHORIMYCTERUS. This is Characidium with two series of teeth in the lower jaw; the external series, like the premaxillaries, tricuspidate; the posterior series simple. Lateral line complete. *C. tenuis* sp. nov. Scales large, 3—39—2. Radii; D 11; A 9; V 9; P 12. Depth one seventh; head one fifth; eye one third. Silvery, scales with shaded edges.

DIAPOMA. Teeth as in Tetragonopterus. Operculum excavated above and with sub-operculum produced below lateral line and above pectoral fin to an obtuse apex. No gill-rakers on principal limb of first gill arch. Dorsal fin entirely posterior to ventrals. Belly not acute; an adipose fin. Lateral line interrupted. *D. speculiferum* sp. nov. Scales large; 4—37—5. Radii; D. I 9; A. II 29; V 7; P 11. Depth 3.25; head 3.6; eye 3, equal interorbital width. Border of anal concave. Reflection of metallic mercury, especially on the operculum. No spots.—E. D. COPE.

Descriptions of Three New Rodents from California and Oregon.

1. NEOTOMA MONOCHROURA. Sp. nov.

(Type, No. 1739, Ad. ♂, Col. Academy Natural Sciences, Phila., Grant's Pass, Josephine Co., Oregon; col. by Geo. Kenzer.)

Description.—Size large, tail long, unicolor, exceeding length of head and body. Above, dark brownish gray, darkest medially, brownest on sides from nose to root of tail; tail uniform blackish brown, thickly and equally clothed above and below with rather short coarse hairs; color of tail never (?) appreciably lighter below than above as often seen in *N. fuscipes;* chin, throat, inside of fore-legs to toes,

inside of hams, belly, vent and feet uniform yellowish white to the bases of hairs; line of demarcation between colors of upper and lower parts well defined; hinder soles, heel and lower outer part of hind leg dusky; ears large, minutely and scantily haired on both sides; whiskers black and nearly twice as long as head.

Measurements (from well stuffed skin).—Total length 460; tail vertebra 216; hind foot 43; ear, from crown 25. Skull, (occipital and pterygoid region missing).—Length from tip of nasals to posterior end of interparietal 50; base of incisor to post-palatal notch 24; greatest anterior width of pterygoid fossa 2.5; distance from post-palatal notch to posterior notch of incisive foramina 10.4; alveolar length of upper molar series 9; greatest zygomatic breadth 27.5; interorbital constriction 6; length of nasals 20; length of mandible, (condyle to anterior point of ramus), 30; width of mandible, (tip of coronoid process to angle), 15.6.

The closest ally of *monochroura* is *fuscipes*, from which it is distinguished by its larger size, pure yellowish white feet and underparts, its longer unicolor tail and dark brown upper parts.

Its cranial differences from *fuscipes* are well marked for the genus They consist in the greater size, greater relative breadth, flat, less convex contour of cranium viewed laterally, greater relative width of molars and the relative narrowness of the pterygoid fossa.

In *monochroura* the ratio of inter-parietal length to breadth is as six to fourteen, in *fuscipes* it is as six to ten; in the former the length of the palatal region from post-palatal notch to incisive foramina is 11 mm., in the latter it averages about 8 mm. In *fuscipes* the post-palatal notch reaches beyond the middle of the last upper molar and the incisive foramina reach back opposite crowns of first upper molars; in *monochroura* the post-palatal notch is opposite the posterior cusp of last molar and the incisive foramina do not reach to the ante-basal line of the upper premolars by 1·5 mm.

The chief differences of dentition may be seen in the upper molar. The coronoid process of *fuscipes* is flattened horizontally above and directed backward, in *monochroura* it is more erect and rounded.

Three specimens of this rat were taken by Mr. Kenzer, who says they often build a very large and conspicuous nest in the sparsely wooded foothills of the Rogue River and Siskyou Mountains. When driven from these nests they betake themselves to the nearest trees with the agility of a squirrel. *N. cinerea occidentalis* was not found in the same region.

2. NEOTOMA INTERMEDIA. Sp. nov.

(Type, No. 1343 ad. ♂ Col. S. N. Rhoads, Dulzura, San Diego Co., Cal., Aug. 21, 1893, Col. by C. H. Marsh).

Description.—Size small, tail slender, short and distinctly bicolor, ears large. Upper parts light brownish-gray lined with black, not darker medially; chin, middle of breast, vent, inside of hind legs, lower two thirds of tail, pes and manus white; rest of under parts, soiled grayish buff, brownest across middle and on sides; bases of hairs darkest; upper third of tail sooty blackish; soles naked, sparsely haired at heel.

Measurements.—Total length 318; tail vertebræ 160; hind foot 35; ear from crown 28; (average measure of 4 adults, length 310; tail 155; foot 34; ear 28). Skull.—Basilar length 33; total length 42; greatest breadth 22; interorbital constriction 5.5; length of nasals 16; interparietal breadth 11.5; length 5.9; length of upper molar series (crown surface), 8; pterygoid fossa to incisive foramina 7.8; length of mandible to upper base of incisor 23.8; height of coronoid process from angle 13.5.

This small, bicolor-tailed Wood Rat from southern California has generally been confounded with *N. mexicana*, but is a different animal, being smaller and larger eared. Its cranial differences are decided. Compared with *mexicana* these are, greater relative size of interparietal, bulging of supraoccipital posteriorly beyond the plane of the occipital condyles, and in the extension of the nasal postero-superior processes of the intermaxillary beyond the base of nasals.

In Dr. Merriam's figure[1] and in Baird's description, these processes terminate opposite the base of nasals, barely reaching the anterior plane of the orbits.

The mandible of *intermedius* is much slenderer and the condyle more prolonged posteriorly, the tip of the latter reaching front of the articular surface of the former.

Seven specimens of this species are in the collection, and I am indebted to Mr. G. S. Miller, Jr., for the loan of others. Mr. Oldfield Thomas described[2] a rat, *N. macrotis*, from San Diego, which, so far as the description goes, must be superficially very like *intermedius*, but it is much larger than any in my series, two of which come from the same locality. The skull measurements of *macrotis* are so applicable to those of *fuscipes* as contrasted with those of *intermedius*, and the colors of the feet and tail in *fuscipes* sufficiently variable to make it pos-

[1] N. Am. Fauna, No. 3, Pl. X. *N. pinetorum*, Proc. Biol. Soc. Wash., 1893, p. 111.

[2] Am. Mag. N. Hist., Sept. 1893, 234.

sible that *macrotis* is a specimen of *fuscipes* with faintly clouded feet and bicolor tail. These considerations induce me to run the risk of imposing a synonym. Two specimens, one from Banning, another from San Bernardino, Cal., seem to represent a pallid race of *intermedius*, differing from the Dulzura Mountain form in the ashy cast of upper parts and the absence of fulvous on the sides and belly, the hairs of chin, breast and ventral region being white to their bases. The skulls of these light colored specimens show their specific identity with *intermedius*. In the involved state of the case as it now stands, I would refer to this race provisionally as *Neotoma intermedia gilva*.

DIPODOMYS PARVUS. Sp. nov.

(Type, No. 1213 ad. ♀, Col. S. N. Rhoads, San Bernardino, California, June 12, 1892, Col. by R. B. Herron).

Description.—Similar to *D. merriami*, but smaller-bodied, longer-tailed and lacking the black on sides of nose and face. Above, buffy gray, becoming purer buff on sides. Spot at base of ear, fringe over eye, sides of nose, (except base of whiskers), forepart of cheeks, fore-legs, inside of hind legs, feet, sides of tail, stripe across thighs and under parts white, strongly defined laterally against color of upper parts. Upper and lower fourth of crested penicillate tail, brownish-black, pencil sooty brown; plantar surface of hind feet brownish; narrow ring around eyes, black.

Measurements.—Total length 248; tail vertebræ 154; hind foot 35; ear (from skin) 10; pencil 25. Skull.—Basilar length 21; mastoid breadth 22.5; interorbital constriction 13; length of nasals 13; crown length of upper molar series 3.6; width of foramen magnum 5; tip of nasals to interparietal 28.4, to extremity of ante-orbital process of maxillary 18.9; greatest ante-orbital width (molar) 20; length of mandible 13.9; height of coronoid process from angle 5.1.

Six specimens represent this species in my collection; three are adult; all were taken in the San Bernardino Valley. The average measurements of adults are somewhat less than those given above. The type is more fulvous than any of the series. Spring specimens are grayer (less fulvous) than type and the tail brush is sooty.

No skull characters or measurements being given for *merriami* by Dr. Mearns, it is impossible to make cranial comparisons with that species.

Compared with *D. similis*[3] and *D. simiolus*[3], *D. parvus* is readily distinguished by its darker, grayer colors. Its skull differs from either of the former in its shortness, greater relative width and size of brain case.

[3]Proc. Acad. N. Sci., Phila., Nov., 1893.

In *parvus* the ratio of mastoid breadth to greatest ante-orbital jugal breadth is 88.8, in *simiolus* it is 82.6, in *similis* it is 86.8.

Of the two, *parvus* much more nearly resembles *similis* than *simiolus* in cranial characters and it is possible that a fuller series will show *parvus* to be merely a small, dark subspecies of *similis*.

SAMUEL N. RHOADS.

Zoological News, Vermes.—In a recent paper on the *Ocnerodrilus*, Mr. Gustav Eisen gives a detailed description of the anatomical structure of the 10 known species of this genus. All are tropical or semi-tropical in their habitat, and appear to be restricted to the American Continent. According to the author, the systematic position of this genus is a most interesting one, as showing the affinities with both the water and with the land Oligochœta, and bear a close relationship to Beddard's new genus *Gordiodrilus*.

The paper includes a diagnosis and a synoptic arrangements of the species. (Proceeds. Cal. Acad. Sci., Vol. III).

Mollusca.—A list of the land and marine shells of the Galapagos Islands, compiled by Mr. R. E. C. Stearns, has been published in the Proceeds. U. S. Nat. Mus., Vol. XVI. The list is based on the collection made during the voyage of the Albatross in 1887-88, supplemented by examples contained in the U. S. Nat. Mus. and in other collections from authentic sources. The total number of species is 288, varieties 30, making in all 318, which are segregated as follows. Marine Lamellibranchs 61; Scaphopods 1; Gastropods, marine species 205, with 13 varieties; Gastropods, land species 31, with 17 varieties.

Pisces.—A new shark, *Centrina bruniensis*, from the Tasmanian Coast, and a new species of pelagic fish *Centrolophus maoricus*, from New Zealand, are described by Mr. J. D. Ogilby in the Records of the Australian Museum, Sept., 1893. The latter, according to the author. is quite as interesting a discovery as that of Tetragonurus some years ago at Lord Howe Island, and bears a close analogy to it, both genera being Mediterranean types.

A new Cyprinoid fish, *Couesius greenii* from the headwaters of Frazer River, B. C., is described by Dr. D. S. Jordan. The species is related to *Couesius plumbeus* of the upper Missouri and Lake Superior region, from which species it differs in the larger size of the scales and in some details of form. The head is especially large and heavy. (Proceeds. Nat. Mus., Vol. XVI).

Reptilia.—Mr. Edgar R. Waite has commenced an investigation of the Australian Typhlopidæ. In his first paper upon the subject he describes a new species *T. proximus*, notes thas *T. curtus* Ogilby must be referred to *T. ligatus* Peters, and decides that *T. ruppelli*, which is generally considered identical with *T. vigrescens* Gray, has a distinct specific rank. (Records Austr. Mus., Vol. II, No. 5, 1893).

Mammalia.—An experiment recently conducted by a captain of a vessel, assisted by a naturalist who happened to be on board, shows the traction power of a whale 23 meters long, and weighing about 70 tons, to be close to 145 horse power. However under the conditions in which the experiment was performed it is more than probable that the animal did not exert its full strength. The whale might become of use to the man as a working factor, but it can never be depended upon as is the elephant for example.

Among the mammals recently collected by Dr. W. L. Abbott, in the islands north of Madagascar, are two specimens of an interesting new species of *Pteropus* from Aldabra Island. They are described by Mr. F. W. True in the Proceeds. Nat. Mus., Vol. XVI, under the name *Pteropus aldabrensis.*

New Mammals.—In the fifth volume of the Bulletin of American Mus. Nat. Hist. are from papers dealing with new or little known mammals. Mr. J. A. Allen describes *Didelphys* (*Micoureus*) *canescens* from Tehuantepec, *Oryzomys costaricineis* from Costa Rica. Mr. Frank M. Chapman describes *Oryzomys palustris natator* from North Carolina and Florida. In a paper by both gentlemen an account is given of a collection of mammals from Trinidad. 65 species are enumerated as constituting the fauna of the island, of which the following are new:—*Chœronycteris intermedia, Nectomys planipes, Tylomys couesii, Oryzomys speciosus, O. trinitatis, O. velutinus, O. brevicauda, Loncheres castaneus* and *Echimys trinitatis.*

EMBRYOLOGY.[1]

Embryology of Sponges.[2]—Mons. Yves Delage in an interesting paper describes discoveries, the acceptance of which implies the overthrow of our present ideas of sponge morphology. The post-larval development of three silicious sponges, Spongilla, Esperella, Reniera and of a horny sporge, Aplysilla, was followed, and it was found that in the essential features of development all the forms agreed.

Larva.—The larva in all four sponges is a solid larva, the superficial layer of which is composed of slender ciliated cells. The inner one contains, except in Aplysilla, three distinct kinds of cells, each kind destined to form a particular part of the adult body. Just beneath or scattered between the basal parts of the superficial elements, is a discontinuous layer of rounded or irregular cells, which the author claims form the definitive epidermis, and which he, therefore calls epidermic cells. Internal to this layer is a mass composed of amœboid and "intermediary" cells, the former characterized as well by the nucleus as by the power of throwing out pseudopodia, while the latter are immobile cells of rather a negative nature. In the Aplysilla larva the two latter classes cannot be distinguished.

While in Spongilla the ciliated cells form a continuous covering for the larva, in the larvæ of the three other sporges they are absent over one of the poles, posterior in Esperella and Reniera, anterior in Aplysilla. Here the epidermic cells lie at the surface. (Against this interpretation of the cells covering the non-ciliated pole may be urged the observations of the reviewer on Esperella and Tedania, in which sponges it was found that the cells in question and the ciliated cells of the larva are differentiated portions of an external homogenous layer, representing the ectoderm of the embryo.[3])

The large cavity which, as is well known, occupies the anterior portion of the Spongilla larva has, according to the author, no morphological significance. It is only a magnified lacuna, such as is found here

[1] Edited by E. A. Andrews Baltimore Md: to whom contributions may be addressed.

[2] Embryogénie des Eponges. Yves Delage. Archives de Zoologie Expérimentale et Génerale. Année, 1892. No. 3.

[3] Notes on the Development of Some Sponges. Journal of Morphology. Vol. V, No. 3, 1891.

and there in the inner mass of all solid sponge larvæ, and disappears during metamorphosis. It is probably concerned in maintaining the equilibrium of the larva.

Metamorphosis.—It is commonly believed that the ciliated cells of the larva flatten and become the epidermis of the adult, but Delage finds that the former absorb their cilia, assume a rounded shape and migrate into the interior, their place being taken by the epidermic cells which fuse with one another so as to form a complete membrane. Only over the non-ciliated pole of the larva does this inter-change of cells fail to take place, for here the epidermic cells have all along been at the surface.

The ciliated cells that migrate into the interior are destined to become the collared cells of the flagellated chambers. The interval between their immigration and the formation of the chambers is marked by a curious association of these cells with the amœboids. The latter elements engulf, amœba-fashion, the former. Complete fusion takes place between the bodies of the amœboid and the absorbed cells, but the nuclei of the latter remain distinct, and range themselves round the larger nucleus of the amœboid. (Multinucleate cells, whether formed in this way or not, undoubtedly exist in the developing sponge. They were observed by Götte (1888) who regarded the smaller bodies contained in them and arranged round the larger central one, as deuto-plastic structures, which become nuclei. Moss (1890) regards the small peripheral bodies simply as deutoplastic structures. Wilson (1891) describes them as nuclei). In Spongilla all the ciliated are so absorbed. In the other sponges only a portion are so absorbed. The rest unite with one another and with the (now) multinucleate amœboids to form a syncitium. To form a flagellated chamber several multinucleate masses approach one another so as to surround a central space, the cavity of the future chamber. The nuclei of the absorbed (ciliated) cells arrange themselves round this cavity and cell bodies are differentiated about them, while the nucleus of the original amœboid cell, surrounded by protoplasm, escapes from the anlage of the chamber, and becomes one of the wandering cells of the adult mesoderm (the reviewer, l. c., has shown that chambers are sometimes formed by the fusion of multinucleate masses, but has also shown that chambers may be simultaneously formed by aggregations of amœboid or "formative" cells, which may or may not be multinucleate. The two processes are regarded as fundamentally the same. Such observations would seem to contradict the author's thesis that it is the immigrated ciliated cells which form the

chambers). The remaining ciliated cells forming the syncytium, unite in a similar manner and build up flagellated chambers.

The chambers are thus formed independently of any central space. The canals are likewise formed independently of each other, as so many irregular spaces, which gradually become lined with an epithelium consisting of "intermediary" cells, the remaining "intermediary" cells becoming the stationary elements of the adult mesoderm. The union into a connected system, of chambers and canals, with the formation of pores and oscula complete the development.

The conclusions enunciated in this paper as to the origin of the canal epithelium and the collared cells of the chambers differ from those presented in the author's previous notes on sponge embryology (Comptes Rendus, 1890, 1891), though the account of the formation of the adult epidermis remains the same. On these points the paper is nearly in harmony with the recent contribution of Maas on the metamorphosis of Esperia (1892), though Maas derives both canal epithelium and collared cells from immigrated ciliated cells. The weight attaching to this harmony of observation on the development of Esperella, is however, lessened by the direct contradiction in the accounts, given by these two authors, of the Spongilla development. In the latter sponge, which according to Delage agrees with Esperella, Maas (1890) has described and figured in a most detailed way the transformation of the larval ciliated cells into the flattened definitive epidermis.

Germs Layers.—As the author points out, his discoveries make it extremely difficult to draw a comparison between the germ layers of the sponges and those of other Metazoa. The case of Sycandra he thinks already constituted a serious difficulty. In this he adopts the point of view of Balfour, and is accordingly perplexed to find granular cells, such as in other larvæ constitute the entoderm, here forming the adult epidermis, while the ciliated cells invaginate to form the epithelium of the paragastric cavity. But the difficulty reaches its height when he attempts to compare the larva of Spongilla with that of other animals. This larva is covered on the outside by cells, which eventually form the epithelium of the flagellated chambers. While the cells which will constitute the adult epidermis are in the larva situated in the interior, i. e. beneath the surface layer of ciliated cells. These facts place us in a dilemma. Accepting the ordinary views on the structure of the sponge body, we would call the epidermis of the adult, ectoderm, and the epithelium of the flagellated chambers, entoderm. Adopting this position, we reach on turning to the larva of Spongilla, the strange conclusion that the swimming larva is covered with a layer of entoderm,

while the ectoderm is internal! If, discouraged at this result, we decide to regard the germ layers as occupying the same relative position in the Spongilla larva as in the larvæ of other Metozoa, and therefore call the superficial layer of ciliated cells ectoderm, and the inner mass of cells entoderm, we reach the equally strange conclusion that the adult epidermis is composed of entoderm, while the lining epithelium of the flagellated chambers is formed of ectoderm! The only way out of the dilemma is to regard the sponges as a phylum which has followed from the start a path of development distinct from that of Cœlenterates and other Metazoa. This being so, a comparison of layers is impossible.

H. V. Wilson.

Development of the Newt.—Edwin Oakes Jordan[3] presented for the Ph. D. degree at Clark University a study of the common newt *Diemyctylus viridescens* Raf., that contains a very clear account of the maturation of the ovum, fertilization, cleavage, and formation and fate of the blastopore in addition to many new facts in the breeding habits of this interesting amphibian.

The "yolk nuclei" are considered at some length and regarded as "having a real physiological significance, probably related to the construction of yolk." In this formation of yolk there is "nothing to indicate that the yolk spherules increase by division, everything on the contrary indicates that they arise from points of independant origin."

The nucleoli in the egg nucleus are described in their formation and disintegration and the idea advanced that they may be but enlargments of the minute granules making up the chromatin threads. Regarding the nucleoli as of nutritive function, acting during the anabolic period of maturation, the author would suggest that they might be compared with the macronucleus of an infusorian.

In the formation of the polar bodies there is an accumulation of pigment at the pole of the spindle suggesting the presence of a centrosome, but none could be found. Much in the same way the entering sperm, in fertilization seems to exhibit an attractive influence over the pigment granules. Elsewhere, however in speaking of the gastrula, the author supposes that pigmentation of the cells is a mark of physiological activity; so that we are left in doubt as to how for an apparent attraction of pigment may be a new formation of it.

In the account of the process of fertilzation we learn that there is no fixed and predetermined point of entrance of sperm and moreover several may, in fact normally do, enter one ovum without in any way causing abnormal development.

[3]Journal of Morphology. VIII. 1893.

The reader of this chapter will notice how easy it is to extend ones anthropomorphism even to unclei!

The noticeable fact brought out in studying the cleavage is that it is very irregular and variable in normal eggs. Even the third plane that we expect to find horizontal may be so only in a small part of its extent or, more often, quite vertical. These points will be considered in another paper by the author and Mr. Ecleshymer.

The long axis of the animal is found to develope at right angles to the first cleavage plane: not agreeing with what seems the rule in the frog. This first plane cuts the egg at right angles to its elongation, (it is elongated by pressure in the oviduct) and this invariable rule is, the author holds, the result of that pressure, the first spindle being able to place itself more readily in the one direction than in any other. He thus adopts, provisionally, a mechanical explanation of the determination of the first cleavage plane in the newts' eggs.

In the vexed subject of gastrulation the author's position is that invagination, to some extent, does actually occur. Epiboly can be actually seen in living eggs "the small cells roll down over the others (epibolic invagination), and at the same time the cells around the edge of the blastoderm turn in and dissappear from view (embolic invagination?)"

The blastoderm closes in first from all sides equally then, usually, more rapidly and equally from the right and left side, but sometimes from behind forward more rapidly, occasionally, perhaps, from before backword more rapidly.

A slit is thus formed, which at first opens into the archenteron along its whole length but soon closes, except its anterior end, the evanescent neuropore, and its posterior end the definitive anus.

The author restricts the term primitive streak to the liner fusion of the germ layers.

The conspicuous ectodermal furrow, "neural groove," is thus no part of the primitive streak: it may be merely a result of mechanical stresses.

The mesoblast is figured as presenting, in some cases, most marked lateral pouches at the anterior end of the embryo.

Amphioxus.—Prof. E. B. Wilson[4] has published a fully illustrated account of the most important experimental work upon the eggs of Amphioxus mentioned in the January NATURALIST.

Animal eggs show three chief types of cleavage the radial, the

[4] Journal of Morphology. VIII. August 1893.

spiral and the bilateral. In Amphioxus individual eggs are found that conform to each of these types; other intermediate methods are also observed. All these normal modes of clecvage are figured and described with great clearness.

Any attempt to draw a close comparison between the cleavage of Amphioxus and that of the Annelids must fail. The tempting pole cells that the text books have inherited from Hatschek's account cannot be found: "the pole cells of Amphioxus are a myth."

By the method of Driesch the cleavage cells may be isolated and the subsequent cleavage of these studied. Many important facts result of which but a few may be referred to here.

One of the first two cells, completely isolated, may cleave like an egg, form a blastula, gastrula and even larva of the one gill-slit stage, all perfect but of half the normal size. If the cell is not completely isolated from its fellow but merely displaced it will develope more or less separate from its fellow so that all sorts of twins or more or less completely doubled, embryos, blastulas, gastrulas and larvæ result. Here it is of great import to note that the first cleavage of the displaced cells determines the axial relations of the resulting double monsters. "*Even a slight displacement of blastomers in the two-celled stage causes a change in the form of cleavage, such that the blastomers of the half embryo cannot be identified individually with those of a normal embryo half. The normal embryo develops as a unit; if it be disturbed in the two celled stage, this unity is destroyed and two new units established.*"

Moreover it would seem that "the unity of the normal embryo is not caused by a mere juxtoposition of the cells," . . . . "this unity is not mechanical but physiological" . . . . "there must be a structural continuity from cell to cell that is the medium of coordination and that is broken by mechanical displacements of blastmeres."

Returning again to the actual observations. One of the first four cells when isolated may cleave like a whole egg, may form a perfect blastula, gastrula, larva of one fourth the normal size. If the cells of the four-cell stage are not completely isolated various double, triple and quadruple blastulas may arise.

The isolated cell of the eight-cell stage may cleave in a way much like a whole egg but not identical with it. Rarely a blastula may result, one of one eight the normal size.

The author then applies all these observations to the questions of regeneration and the Mosaic Theory of Development. He takes a somewhat middle or combination position between the views of Driesch

and Hertwig on the one hand and of Roux and Weismann on the other.

Roux and Weismann hold that histological differentiation is due to *qualitative* divisions of the idioplasm in successive mitotic cell cleavages and that the embryo is thus a mosaic of self-determining cells: moreover they assume that each cell may also receive *quantitatively* some unmodified idioplasm that remains dormant till called into activity by injury, etc., when regeneration of lost parts is to be accomplished. All this Wilson rejects: retaining, however, a modified form of the mosaic theory, believing that this principal does come in after the earlier stages of cleavage and at very different periods in different animals (the differentiation is however a physiological one, there being no loss of nor unequal distribution of actual idioplosm in cell divisions).

That the ontogeny is determined by the character of the ovum at the first; these first phenomena determine the subsequent ones; the prospective value of a cell is a function of its position at first but in later stages becomes fixed by internal changes largely due to the action of the whole upon this cell, these are conceptions in which Wilson comes into closer agreement with Driesch and Hertwig.

Experimental Studies on Teleost Eggs.—Dr. T. H Morgan[5] claims some very important and valuable results from an application of the experimental method to the study of early stages in the embryology of the fish, Ctenolabrus, Serranus and Fundulus.

Awaiting the publication of an illustrated paper we can here note but a few of the chief facts presented in this preliminary communication.

If one of the first blastomeres is removed and destroyed the other may develope a normal embryo which is larger than half a normal embryo but not as large as an entire one.

If half or two-thirds of the yolk be removed from the egg the cleavage is modified and the blastoderm has a peculiar shape yet a normal embryo results.

When the blastodisc is compressed so that a flat plate of cells is formed by cleavage there yet results a normal embryo.

If the germ ring be cut upon one side the embryo continues to be formed and is normal. It can also be shown by markimg the membrane with carmine that the head is a fixed point, the elongation of the body being posterier to this. Hence it follows that the germ ring takes no important part in the formation of the embryo and the *concrescence* theory receives a very severe blow.

[5]Anatomischer Anzeiger. VIII. 1893.

Formation of the Annelid Eye.—Our knowledge of the embryonic stages of the eyes of Annelids has been so scanty that the additions made by Ed. Beraneck[6] cannot be but welcome however little claim they may have to being exhaustive.

The author has studied the egg of the Alciopidæ, in the larva and adult and added to what had been previously made known by Kleinenberg and Greef. The eyes in this family of annelids, it will be remembered, rank amongst the most complex and perfect of visual organs and are far larger and more specialized than those of any other annelids. The structure is as follows; the optic vesicle is closed, a single layer of cells acting as cornea on the side next the thin epidermis and as retina elsewhere. Within the vesicle are the dioptric media: a spherical lens next the cornea, a very voluminous vitreus body filling up the large vesicle and subdivided into an outer part towards the retina and a major mass towards the lens, finally the rods that tip the retinal cells and line the vesicle except on the side of the cornea. It is important to note that the eye is a closed vesicle not a cup as has been claimed by Graber and denied by Graff and Carrière. Moreover this vesicle is a single layer of cells, hence the retina is a single layer of cells, each having a long rod pointing towards the centre of the eye. In the adult there are no cells in the eye except those that form the walls of the vesicle: neither lens nor vitreous body presents any signs of cellular origin. The piginet of the retina is in the cells that bear the rods, at the end whence springs the rod.

It is thus obvious that this eye has no resemblance to the arthropod eye: as the author points out in detail.

The formation of the eye is made out from sections of larvæ. The earliest taken, 3 mm. long, living it will be remembered inside a Ctenophore, has already two large masses of cells separate from the ectoderm and crowded on either side of the few brain cells. These masses are the eyes as first observed. Each is a solid mass with numerous nuclei. Of these nuclei the author would distinguish three kinds—the small ones that form the future vesicle: a few large ones that form certain remarkable gland cells, and finally a single cell in each mass destined to form the beginning of the lens.

In a remarkable way this cell by degeneration forms a centre about which products formed by gland cells aggregate till a minute lens is seen surrounded by more liquid substance: the space so hollowed out in the eye is still surrouned by numerous cells that gradually specialize as the cornea and retina.

[6]Revue Suisse de Zoologie. I. June 1893.

Very early some of these retinal cells form a rod at the free end and afterward isolated grains of pigment appear in these cells, near the rod end. Meantime the few large gland cells, in the retina, instead of forming rods form a secretion poured out between the lens and the retina. The lens grows enormously, has no longer any trace of its cell origin, and is believed to increase, in some way, by aid of the glandular secretion.

The remarkable gland cells that are mentioned above as occuring even in the youngest larva studied may be found in the adult. They have the important function of secreting the vitreous body.

Each eye has one of these peculiar glands (they are not to be compared with minute gland cells seen in the retina) lying outside the wall of the retina though in its origin one of the mass of cells that gave rise to the whole eye.

This gland is a large protoplasmic mass with two large nuclei and often numerous smaller nuclei and leads through the retina into the optic vesicle by a sort of duct or process.

One other point the author has elucidated is the so called ciliary body, which proves to be merely a part of the retina that developes in an isolated position at the edge of the cornea.

It is apparent that as this eye arises quite independently of the brain and, as far as the authors observations go, of the epidermis also little comfort is to be got from it for those who would reduce the Annelid eye to a simple epidermal thickening: they must fall back upon the statement that the ontogeny of this highly specialized eye in an apparently aberant group throws no light upon the phylogeny of the Annelid eye.

ENTOMOLOGY.[1]

Evolution and Taxonomy.—Under this general title Professor J. H. Comstock has published an extremely important and suggestive easay.[2] Starting with the evident proposition that the systematists of to-day are not making as much use of the theory of descent in taxonomic work as they might, the author suggests that "the logical way to go to work to determine the affinities of the members of a group of organisms is first to endeavor to ascertain the structure of the primitive members of this group; and then endeavor to learn in what ways these primitive forms have been modified by natural selection, keeping in mind that in each generation those forms have survived whose parts were best fitted to perform their functions." Some of the difficulties to be encountered in the carrying out of this suggestion are next considered. "As the structure of a highly organized animal or plant is too complicated to be understood in detail at once, it is suggested that the student begin with the study of a single organ possessed by the members of the group to be classified." He is to observe the forms and functions of this organ; and to determine its primitive form and the various ways in which the primitive form has been modified. Then another organ is to be selected and results compared. In this way a provisional classification can be made.

The second part of Professor Comstock's essay considers the evolution of the wings of insects. The method above suggested is here applied to the wings of the Lepidoptera; and is followed by a contribution to the classification of the Lepidoptera which forms the third part of the essay. This classification is a provisional one, but the author confidently expects "that the principal conclusions stated here will be confirmed by a study of other parts of the body; for in Nature's court the testimony of different witnesses, if rightly understood, will agree."

The proposed classification is indicated in the following table:

[1]Edited by Clarence M. Weed, New Hampshire College, Durham, N. H.

[2]Evolution and Taxonomy. An essay on the application of the theory of natural selection in the classification of animals and plants. Illustrated by a study of the evolution of the wings of insects and by a contribution to the classification of the *Lepidoptera*.—Reprinted from the Wilder Quarter-Century Book—Comstock Publishing Co. Ithaca, New York.

A. Suborder JUGATÆ.
  B. *The Macrojugatæ* — Family HEPIALIDÆ.
  BB. *The Microjugatæ* — Family MICROPTERYGIDÆ.
AA. Suborder FRENATÆ.
  B. *The Microfrenatæ.*
    C. *The Tineids* — Superfamily TINEINA.
    CC. *The Tortricids* — Superfamily TORTRICINA.
    CCC. *The Pyralids* — Superfamily PYRALIDINA.
  BB. *The Macrofrenatæ.*
    C. *The Frenulum-conservers.*
      D. Moths in which the reduction of the anal area of the hind wings precedes the reduction of the anal area of the fore wings. No N. American species. *Castnia* an example.
      DD. Moths in which the reduction of the anal area of the fore wings precedes the reduction of the anal area of the hind wings.
        E. *The Generalized Frenulum-conservers.*
          F. Moths in which a great reduction of the subcostal cell of the hind wings is taking place.
            G. Moths in which the anal veins of the forewings anastomose so as to appear to be branched outwardly. — Family MEGALOPYGIDÆ.
            GG. Moths in which the anal veins do not anastomose in such a way as to appear branched outwardly. — Superfamily ZYGÆINA. (in part)
          FF. Moths in which the subcostal cell of the hind wings is not greatly reduced.
            G. Moths in which the anal veins of the forewings anastomose so as to appear to be branched outwardly. — Family Psychidæ.
            GG. Moths in which the anal veins do not anastomose in such a way as to appear branched outwardly.
              H. — Family COSSIDÆ.
              HH. — Family LIMACODIDÆ.
        EE. *The Specialized Frenulum-conservers.*

F. DIOPTIDÆ.

FF. *The Geometro-Bombycids and the Geometridæ.*

Families NOTODONTIDÆ, BREPHIDÆ, GEOMETRIDÆ.

FFF. *The Noctuo-Bombycids and the Noctuids.*

Familes CYMATOPHORIDÆ, NOCTUIDÆ. LIPARIDÆ, AGARISTIDÆ, and ARCTIIDÆ.

FFFF. *Isolated families of specialized frenulum conservers*

Families SESIIDÆ, THYRIDIDÆ, SPHINGIDÆ, and Superfamily ZYGAEINA.

CC. *The Frenulum-losers.*

D. *The Frenulum-losing Moths.*

Superfamily SATURNIINA and families DREPANIDÆ and LASIOCAMPIDÆ.

DD. THE SKIPPERS.—Butterflies in which all of the branches of radius of the fore wings arise from the discal cell. Family HESPERIDÆ

DDD. *The Butterflies.*—Butterflies in which some of the branches of radius coalesce beyond the apex of the discal cell.

Families PAPILIONIDÆ, PIERIDÆ, LYCÆNIDÆ and NYMPHALIDÆ.

The essay is illustrated by an admirable plate engraved on wood from Nature by Mrs. Comstock and a large number of ink drawings by Mr. E. P. Felt.

Habits of Halobates.—Mr. James J. Walker of the British Royal Navy has recently published[3] an account of his observations on the peculiar bugs of the genus Halobates. He has studied them in many seas for several years, finding the habits of the various species much alike. "In tropical latitudes, when a sailing ship is becalmed, or a steamer is stopped for any purpose on a perfectly calm sea, it is not long before little whitish creatures are seen rapidly swimming over the glassy surface with a sinuous motion, and soon half a dozen or more Halobates are in view at once, evidently attracted by the bulky hull of the ship which they will approach frequently within arm's length. Their progress seems to be effected by a sort of skating action of the long, ciliated, intermediate and hind legs. When the ship is anchored in a current or tide way, they keep abreast of her by a series of short rushes of a foot or so against the stream, giving a

[3]Ent. Month. Mag. 2d. ser. v. IV, p. 227.

speed quite sufficient to stem a current of two or three knots per hour. * * * They seem to like the sunshine and were much scarcer when it was overcast. A heavy swell, provided the weather is quite calm, does not prevent their appearance, but with the ripple caused by the slightest breeze they vanish at once. * * * I have kept the Chinese species alive for several days in a vessel of sea water, at first they are very restless, rushing about and occasionally jumping up two or three inches from the surface, but after a few hours they became much quieter. They then rest on the water with the legs widely extended, and the intermediate pair brought forward so as to have the tarsi in advance of the head. On the approach of a pencil or the finger they dive readily, and swim with great facility beneath the surface, the air entangled in the pubescence giving them a beautiful appearance like that of a globule of mercury or polished silver. This supply of air must be essential to the existence of the insects, which I feel sure must pass a large part of their life beneath the surface of the sea, diving into undisturbed water in rough or even moderate weather, and coming up again only when it is absolutely calm."

Mr. Walker is unable to add anything to our knowledge of the feeding habits of these bugs. "The union of the sexes takes place on the surface of the sea, and the eggs are unquestionably carried about by the female attached to the extremity of the abdomen for some time before she parts with them." Two females of *H. Wulderstorffii* were taken from the Marquesas Islands with eggs thus attached. The eggs are large for the insect, cylindrical with rounded ends, and ochraceous yellow. Where they are finally deposited he did not observe though[4] in a subsequent note attention is called to Witlaczil's record of the finding of a bird's feather at sea covered with the eggs of Halobates.

Pupation of Gyrinus and Dineutes.—Mr. H. F. Wickham continues his studies of the early stages of North American Coleoptera, his latest contribution[5] including descriptions of nine species. He describes the larva of *Gyrinus picipes* as pupating in mud cells without any intermixture of silk. "Probably the larva uses any readily accessible matter in the formation of its cell and when under stones would use mud, while if under bark might utilize wood or bark fibre, thus giving the 'cocoon' a papery consistence." The pupation of *Dineutes assimilis* is described thus: "The larvæ on coming out of the water repair to the under surface of a stone or a board close

[4]lc. p. 252.

[5]Bull. Lab. Nat. Hist. Univ. of Iowa. II, pp. 330—344, pl. IX.

enough to the waters edge to insure continued dampness, and there construct an oval cell of earth, without any admixture of silk so far as I can find. These cells are not simple excavations of earth beneath the stone but are built upon it like the cells of some of our mudwasps, and are not very unlike them in shape."

Hermann August Hagen.—This veteran entomologist, for many years Professor of entomology at Harvard College, died at his home in Cambridge, Nov 9 last. Born in Königsberg, Prussia, May 30, 1817, he graduated in medicine in 1840, and was a practicing physician in Königsburg until 1867. He then, at the invitation of the elder Agassiz, came to Cambridge to become Curator of the entomological department of the Museum of Comparative Zoology, a position which he retained until his death, though because of ill health he has not been actively at work for several years. Dr. Hagen has long been known as an authority in entomology, especially on the Neuroptera and their allies; and by his work at the Museum has greatly helped the development of the science in America.

Entomological Notes.—Professor L. M. Underwood has edited and the U. S. National Museum has published (Bull. 46) the papers on North American Myriopoda written by the late C. H. Bollman. The Bulletin covers more than 200 pages and must form the basis of future work on this neglected group.

At the meeting of the London Entomological Society, Oct. 4, specimens of Lepidoptera which had been exposed in the pupa stage to low temperatures were exhibited by Mr. F. Merrifield. "*Vanessa polychloros* was much darkened, especially toward the hinder margin, by a low temperature. *Vanessa c-album* showed effects on both sides, especially in the female; they were striking on the under-side. Some *Vanessas* showed the gradual disintegration, by exposure to a low temperature, of the ocellus on the fore wing, which in extreme specimens ceased to be an ocellus."

Various species of Vespa have been so abundant the past season in Great Britian that accounts of the "Plague of Wasps" have been occasionally published. Their unusual abundance is attributed to recent favorable meteorological conditions.

The U. S. National Museum has published in the Proceedings (No. 950) "A Descriptive Catalogue of the Harvest-spiders (Phalangiidæ of Ohio" by Clarence M. Weed. Fifteen species or subspecies are included in the list.

Prof. J. B. Smith describes [6]the new genus Tristyla with one species, and seven other new species of Noctuidæ collected by the Death Valley expedition.

In reporting on a collection of ants from Lower California and Sonora, Mexico, M. Theo Pergande describes[7] two new species of Camponotus and one each of Atta and Aphænogoster, as well as a new variety of *Pogonomyrex badius* Ltr.

Mr. Lawrence Bruner furnishes as his report as Entomologist to the Nebraska State Board of Agriculture a valuable discussion, covering more than one hundred pages, of the Insect Enemies of the Small Grains. The list includes 143 species distributed among the orders thus: Diptera, 24; Hymenoptera, 11; Lepidoptera, 22; Coleoptera, 33; Hemiptera, 28; Thysanoptera, 2; Orthoptera, 18; Thysanura, 3; Acarina, 2.

The peculiar pocket like abdominal appendages of female moths of the family Acræidæ are believed by A. F. Rogenhofer to be used in copulation.[8]

From recent studies of the pupæ of moths Dr. G. A. Chapman concludes[9] that the Pterophoridæ are not closely related to the Pyralidæ or Alucitidæ.

The discussion concerning the "highest" order of insects has been recently continued in *Science* by Packard, Smith and Riley, all of whom favor the placing of the Hymenoptera above the Diptera.

From recent anatomical studies, Krasilstschik concludes[10] that Phylloxera and Chermes should form the family Phylloxeridæ and should be regarded as more primitive than the Aphididæ or Coccidæ.

Dr. C. V. Riley's report as entomologist to the U. S. Department of Agriculture for 1892 discusses recent international exchanges of beneficial insects, the importation of two dangerous insects—the potato tuber worm (*Lita solanella* Boisd.) and the Olive Pollinia (*Pollinia costæ* Targ,)—the spread of the horn fly, the ox bot, the rose sawflies, the strawberry weevil, the elm leaf beetle and experiments with the European white grub fungus. In addition to these discussions there is a brief review of the work of the field agents of the division, and summarized accounts of the pea and bean weevils, the sugar-beet web worm (*Loxostege sticticalis* L.), the sugar-cane pin borer (*Xyleborus perforans* Woll.), and the new insectary of the department.

[6]Insect Life, V, 328—344.
[7]Proc. Cal. Acad. Sci., ser. 2, v. IV, pp. 26—36.
[8]J. R. M. Soc., 1893, p. 322.
[9]Trans. Ent. Soc. London, 1893, p. 97 et seq.
[10]Zoolog. Anzeiger, 1893.

A number of interesting entomological papers have been published by Mr. F. M. Webster in the third issue of the technical series of the Bulletin of the Ohio Experiment Station. Many new species of insects are described by specialists. The publication of these new species in such a bulletin is certainly of questionable propriety, unless they also appear in entomological journals. Such bulletins are of decided value and are useful outlets for much matter that accumulates in pursuance of station work—such as biographies, faunal lists, etc.—and it is desirable that they be confined to this instead of containing isolated descriptions of new species.

ARCHEOLOGY AND ETHNOLOGY.[1]

The "Plateau Implements" of Southern England.—It is natural to suppose, whether we believe in the skeleton of Castenodolo, the scratched bones of Monte Aperto, and the worked flints of Thenay and Otta or not, that man did not of a sudden manufacture "Turtle-backs" of Chellean type, and that somewhere on the globe stones flaked more rudely than the rudest of these, tell of his childish handiwork.

The question as to the 2500 flint pebbles, nicked, nipped, notched, saw edged, and sharp ended, called "Plateau Implements" and collected by Mr. Benjamin Harrison near Itham in Kent, England, is whether they are or are not artificial.

The gravels from which they come have not been geologically dated by intermixed fossils, but the beds—if not Tertiary must be far older than the drift "turtle-back" bearing strata of the Darent vale below them. They spread for miles along a ridge-top 340 feet above the sea, with no place to wash from and cannot therefore be connected with the present river system of South England.

Where the surface loam has been weathered off them, the yellow patinated "implements" are found lying on the gravel, and it is asserted that the latter are in place and not dropped there like the white chipped celts of Neolithic men that sometimes lie with them.

Careful trenching is needed to demonstrate the true position of these strange stones, duplicates of which Mr. Worthington G. Smith says he has found in the later drift deposits along with "Turtle-backs" near Dunstable, in Bedfordshire. But Professor Prestwich one of the first recognizers of Boucher de Perthes' discovery in 1859, views Mr. Harrisons specimens which now awaken contention, as the handiwork of men living before the time of the drift.

Quaternary Gravel Specimens in Spain.—In October, 1892, the Baron de Baye visiting the Quaternary gravel exposures at San Isidro on the right bank of the Mazanares opposite Madrid, bought from a workman two "Turtle-backs" (if we may here use the inoffensive word) one of quartzite and one of flint, of the type called Chellean by M. Gabriel de Mortillet (more or less leaf shaped and chipped on both sides) also one other specimen of flint of the pattern called Mousterian by de Mortillet (ie, chipped only on one side,)

[1] This department is edited by Mr. H. C. Mercer, University of Pennsylvania.

The workman told M. de Baye that he had found the Chellean and Mousterian specimens close together in the same top layer, and the latter repeated the statement before the meeting of the Societé de Anthropologie at Paris on July 15, 1893, reading also a letter from M. Siret the geologist who said he had discovered in the summer of 1892, 30 Chellean, 1 Solutrian (broad thin well worked leaf shaped blade) and 6 Mousterian specimens in the self same upper stratum.

Two Mousterian objects of this list were shown but how many of the 37 were found with M. Sirets' own hands in place does not appear.

If these stone Implement types running through the drift deposits and cave layers of France. (a) Chellean (River Drift), (b) Mousterian (cave period of chipping flakes on one side only) (c) Solutrian (cave period of finest blade chipping) and (d) Magdalenian (cave period of bone implements and animal sketching) represent cultural epochs in Mans' evolution as is claimed by M. de Mortillet, then these Spanish specimens should have been found in separate layers, or at intervals, and not all close together at about 6 to 15 feet from the surface.

M. de Mortillet objected at the meeting that hearsay did not prove the alleged mingling. He said that the two Chellean "Turtle-backs" shown were not typical and believed that if the case were reconsidered a sequence of the types would be found in the different layers at San Isidro, as in France.

It was unfortunate that M. Siret was not there to explain his startling assertion that everything was unclassifiably jumbled together in the upper layer. But to find the Chellean at the top, was what I afterward did when I pulled out a leaf shaped "turtle-back" of flint[2] from the perpendicular bank of the Carreña Sacerdotal at a depth of 1·80 metres from the surface, on Dec. 31, 1892.—H. C. MERCER.

The non-existence of Paleolithic Culture.—Mr. J. D. McGuire in the American Anthropologist for July, 1893, denies the existence of a time when Man chipped but could not polish stone. Assailing not the antiquity of human remains but their cultural significance, and backed by his valuable and unique experience in the carving, polishing and boring processes of the stone age, he attacks Sir John Lubbocks celebrated definition as follows.

(1) Battering and grinding is easier than chipping and so must have preceeded it.

(2) Paleolithic Men made pottery for it is found in the Paleolithic

[2] Now in the Archæological Museum of the University of Pennsylvania at Philadelphia.

caves of Spy in Belgium (under Mousterian), Trou Magrite Belgium (with Mammoth and Rhinoceros), Nabrigas, France (with cave Bear), and Engis Belgium (with Rhinoceros).

(3) Paleolithic cave men bored and carved bone, and used pitted stone hammers at Les Eyzies, La Madeleine, Gorge D'Enfer and Laugerie Basse and therefore should have been able to polish stone.

(4) The absence of Drift specimens in Neolithic graves means that Drift "implements" in Europe are like American quarry "Turtle-backs" not implements at all and so not placed by the Neolithic men who made them, with their dead.

(5) Polished stone implements through made by Drift Men are absent from the Drift because the Drift beds were like American quarries where the stone chipper left no village relics.

(6) The Drift Mans' pottery is not in the Drift because even if lost there gravel washing would destroy it.

We follow these arguments with great interest but think (1) that while Indian blade making of the Quarry time was a complex difficult art, chip knife or "Teshoa" making at one blow, or "Turtle-back" making at 20 blows (if "Turtle-back" is all we want) is easier than hand hammering and grinding. (2) The 2nd argument warrants a review of the cave records, for if Paleolithic cave men did make pottery then the French classification collapses, and the Museums and Handbooks of Europe which it seems have failed to bring out the fact, are not to be trusted. (3) Why men who bored polished and carved bone, sketched realistic animal designs, and chipped blades equal in make to Mexican sacrificial knives did not polish stone seems incomprehensible. But the European Museums clearly assert that no polished stone tool has been found in the caves. If true, the fact is conclusive against Mr. McGuire. The finding of pitted hammerstones in Paleolithic caves involves a tendency to carving in the indentations themselves, but some of these hammers might have been corn and not stone bruisers after all, just as some such (Brough Smith's Aborigines of Victoria p. 385) were used by Australian native divers for clapping under water to scare fish into nets as well as to pound roots.

As to argument (4), the most striking European Drift form, the blunt based "Coup de Poing" is not like the turtle-backs in the American quarries examined. By no quarry turtle-back analysis can it be called an unfinished implement and so unadapted for deposit in graves.

If Neolithic Men made Coups de Poing as Indians made turtle-backs we should only have to go to a Neolithic Quarry to find them, but Spiennes, fairly considered, contains none.

To argument (5) it may be said that European Drift deposits are really analogous to our Riverside workshops where Indian relics are plenty, and not to quarries; while if we do compare them to quarries Indian relics have been found in my knowledge, at four. Realizing this we see no reason why polished implements should not be found in the Drift if the Drift Men made them. The 6th argument as to the destruction of pottery in washing gravel seems conclusive against expecting to find it there.

Thanks are due to Mr. McGuire for his exceedingly interesting and suggestive paper which should suffice to induce revision of the European Cave classification in which as it suggests there may be serious flaws.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

New York Academy of Sciences, Biological Section, Nov. 20. —The following papers were read:—"On the Scope of Modern Physiology," by F. S. Lee; "Notes on recently discovered deposits of Diatomaceous Earths in the Adirondacks," by C. F. Cox; "Systematic Notes on Dracocephalum and Cedronella," by N. L. Britton.

December 4.—Professor H. F. Osborn described and exhibited a series of restorations of lower Miocene mammals including Titanotherium, Aceratherium, Metamynodon, Protapirus, Elotherium, Oreodon and other characteristic forms. This is the first of a series of tertiary mammal groups in preparation.

Mr. O. L. Strong described a new modification of the rapid Golgi method designed to eliminate some of its present defects, i. e., uncertainty of success and irregularity in the stain when attained, due probably in great measure to the feeble penetration of the silver nitrate.

The modification consisted in adding a certain proportion of sodium sulphate to the silver nitrate which the specimens are placed after the hardening in osmic-bichromate.

While this modification has hardly been tried sufficiently to ascertain exactly its merits, it seemed certain that in some cases, at least, it gave much more complete and uniformly stained pictures of the nervous system than the old procedure.

Specimens of the heart of a tadpole and cord of an embryo chick were exhibited.

Professor E. B. Wilson noted a mode of preparation of lobster testis which gave results especially favorable for class work in Cytology.

BASHFORD DEAN, *Rec. Sec.*

Boston Society of Natural History, November 15th, 1893.—The following paper was read: Dr. J. Walter Fewkes, Comparative ceremoniology of the Mexican and Pueblo Indians.

December 6.—The folowing papers were read: Mr. R. E. Dodge, the Geographical Development of River Terraces; Professor W. M. Davis, Facetted Stones from Cape Cod. Both papers were illustrated by stereopticon views.

December 20.—The following papers were read: Mr. Severance Burrage, Observations on insectivorous plant, the thread-leaved Sundew (*Drosera filiformis Raf.*); Merritt Lyndon Fernald, On the geo-

graphical distribution of the flowering plants of the upper St. John River, northern Maine.

SAMUEL HENSHAW, *Secretary.*

The Biological Society of Washington.—Following was the programme of the evening. Symposium:—B. E. Fernow, C. W. Stiles, Theo. N. Gill, Geo. Marx and others; on what are the especial needs of the Biological Society of Washington.

December 2, 1893.—The following communications were read: Mr. Frederick H. Blodgett, Notes on the Development of the Bulb of the Adder's Tongue: Mr. E. W. Nelson, A New Species of Lagomys from Alaska; Dr. Erwin F. Smith, On a Bacterial Disease of Cucumbers, etc., working through the Fibrovascular Bundles; Probably Transmitted by Insects; Dr. C. W. Stiles, The Teaching of Biology in Colleges.

FREDERIC A. LUCAS, *Secretary.*

Odontological Society of Pennsylvania, Saturday, December 9th, 8 P. M.—William Romaine Newbold, Ph. D., of the University of Pennsylvania read a paper: "The Psychological Significance of Hypnotic Suggestion and Kindred Phenomena."

Dr. Thomas Fillebrown of Boston, Mass., opened the discussion. The following is an abstract of Dr. Newbold s paper.

The psychical phenomena of the hypnotic state can for the most part be regarded as due to heightened suggestibility. Suggestibility is found in all normal persons and occurs not infrequently in pathological degree. It can be connected with the conception of the mental state as representing to us cortical processes and hence as a dynamic thing, due to definite causes and necessarily involving definite effects.

Normal perceiving and thinking involves the functioning of the cortex as a whole composed of parts more or less differentiated functionally and standing in multiple intercorrellations with one another. Hence in normal life the effects of any given cortical process or mental state can never be dissociated from those of preëxisting activities and predispositions.

In the condition known as heightened suggestibility, by whatever agency it be produced, the cortical coördination is unimpaired; those activities which chiefly modify the nascent process or state being temporarily inhibited; we can study at leisure the development and results of any artificially produced process, whether connected with consciousness or not.

The kindred phenomena of "the fixed idea," "hysteria," "epilepsy," "double consciousness," etc., are due to analagous disturbances in cortical coördination with sundry local complications.

The relation of consciousness to such states is obscure. In some it undoubtedly exists; in some its existence is questionable.

If the occurrence of telepathic phenomena be admitted, they must be explained rather by the conveyance of suggestion by some means at present unrecognized than as proving the existence of some unknown force in the operator constraining the subject to perform acts against his own will.

ALONZO BOICE, *Secretary.*

SCIENTIFIC NEWS.

The University of Kansas has issued six numbers of the "Kansas University Quarterly." The Natural History articles so far published are as follows:—Kansas Pterodactyls, pts. 1 & 2, by S. W. Williston; Kansas Mosasaurs by S. W. Williston and E. C. Case; Notes and Descriptions of Syrphidæ by W. A. Snow; Notes on *Meliteria dentata* and the Sclerites of the head of *Danais archippus* by V. L. Kellogg; Diptera Braziliana pts. II & III; the Apioceridæ and their allies, and new or little known Diptera by S. W. Williston; The Great Spirit Spring Mound and the Delicacy of the sense of taste among Indians by E. H. S. Bailey; Notes on some Diseases of Grasses by W. C. Stearns; Revision of the genera Dolichopus and Hygroceleuthus and new genera and species of Psilopinæ by J. M. Aldrich. The Quarterly is well gotten out and reflects much credit upon the University.

Professor Hermann A. Hagen died in Cambridge, Mass., Nov. 8th, 1893. He was born in Königsberg, Prussia, May 30, 1817, and received his M. D. from the University there in 1840. Later he studied in Berlin, Vienna, Paris and other European cities. Meanwhile he devoted considerable attention to entomology, and in 1843 published his first paper "Prussian Odonata" This publication gave him considerable reputation. In 1843 he returned to Königsberg, entered on the general practice of medicine, and for three years was first assistant in the Surgical Hospital. From 1863 until 1867 he was Vice-President of the City Council and member of the school board. He became acquainted with Louis Agassiz, who invited Prof. Hagen to leave Germany and come to Cambridge. Prof. Hagen accepted the offer

and became assistant in entomology at the Agassiz Museum. In 1870 he was made Professor at Harvard. Since that time Professor Hagen has kept his connection with the Harvard University, and for years has been one of the most famous men in the University. Professor Hagen's contributions to the science of entomology have been of great value. He received the honorary degree of Ph. D. from the University of Königsberg in 1863, and in 1887 Harvard conferred upon him the honorary degree of S. D. His publications include more than 400 articles, of which the most important was his "Bibliotheca Entomologica," published in Leipzig in 1862.

The stratigraphical collection of Canadian rocks on exhibition at the Columbian Exposition, Chicago, has been catalogued by Mr. W. F. Ferrier. The collection comprises 1500 specimens, and illustrates all the formations known to occur in the Dominion of Canada, from the Laurentian to the Pleistocene. As the collection is very complete, geographically, it is proposed to incorporate it with that already in the Museum of the Canada Geological Survey and thus form an unrivalled series of the rocks of Canada.

Erratum in note of a paper by Mrs. E. G. Britton, on page 826, line 24 from top, the sixth word should be *disproved.*

Albert F. Woods, Assistant in Botany in the University of Nebraska, has been appointed Assistant Pathologist in the Section of Vegetable Pathology of the Department of Agriculture in Washington.

"Briefly describe the heart and its function or work." Ans. "The heart is a comical shaped bag. The heart is divided into several parts by a fleshy petition. These parts are called the right artillery, left artillery and so forth. The function of the heart is between the lungs. The work of the heart is to repair the different organs in about a half minute."

"What are metamorphic rocks?" Ans. "Rocks that contain metaphors."—*London Globe.*